EXPERIMENTS
Eſtabliſhing a CRITERION
BETWEEN
MUCAGINOUS and PURULENT
MATTER.

AND

An Account of the RETROGRADE MOTIONS
of the ABSORBENT VESSELS of Animal
BODIES in ſome Diſeaſes.

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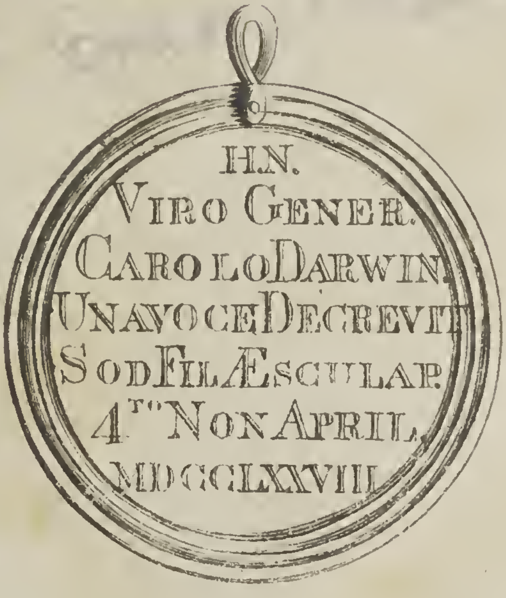

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TO

Dr. ANDREW DUNCAN.

SIR,

THESE pages are with juſtice dedicated to you, whoſe friendſhip was ſo dear to the departed Author; and by whoſe example and incitement he purſued the ſtudy of medicine with ſuch uncommon ardor and ſucceſs---They are juſtly dedicated by me, who revere the inceſſant endeavours, you exert, for the advancement of medical knowledge by your ingenious lectures and publications; and the perpetual humanity, you exhibit, in conducting the diſpenſary for the relief of the indigent ſick.

PERMIT me to add, that I ſhall ever eſteem myſelf under the greateſt obligation to you, not only for the diſintereſted friendſhip you had for my poor CHARLES during his life; but for that unexampled mark of affection, you ſhewed for his remains, beyond the hoſpitality of former times! in offering a place for them in the vault of your family.

YOUR friendly ſympathy will drop another tear on this recital, for a youth, who might have been, had Heaven aſſented, an ornament to medicine, to philoſophy, and to mankind!---

SUCCESS and happineſs attend your virtues! Farewell.

E. DARWIN.

Lichfield, 1780.

EXPERIMENTS ESTABLISHING A CRITERION BETWEEN MUCAGINOUS AND PURULENT MATTER.

> Inſignemque meo capiti petere inde coronam
> Unde prius nulli velarint tempora DOCTI.

Advertiſement.

THE ÆSCULAPIAN ſociety at *Edinburgh*, ſoon after their eſtabliſhment, offer'd a gold medal, for the beſt criterion between *pus* and *mucus*; and, in March 1778, confer'd it on the late Mr. CHARLES DARWIN, for the following diſſertation.

EXPERIMENTS

ESTABLISHING A CRITERION

BETWEEN

MUCAGINOUS AND PURULENT

MATTER.

TO make any obſervations on the utility of a criterion to diſtinguiſh Pus from Mucus would be ſuperfluous; as your adjudging it worthy to be appointed a ſubject for your premium, ſufficiently demonſtrates your ideas of its importance; and to beſtow much time in ſhewing the fallacy of all the commonly received teſts, would be equally unneceſſary to you, who muſt have ſo often experienced it.

I ſhall make no apology for my thus daring to enter the conteſt among the many reſpectable competitors for the honour of your medical meed, ſince your excellent plan contains a general invitation; and I am convinced, if my attempt ſhould fail, this "rudis indigeſtaque moles" will be conſigned to oblivion; and that ſhould the contrary, which I have ſmall reaſon to expect, happen, your approbation would ſtamp a value on this paper much above its real merit.

From experiments alone it is, that we can expect to receive any information on this ſubject; I ſhall, therefore, curſorily mention what have been commonly received as diagnoſtics; then deſcribe the experiments I have made; and, laſtly, conclude with ſome obſervations and deductions, which may juſtly be drawn from them.

The firſt, and the moſt common teſt, is the appearance of the expectorated matter received into water, which is ſuppoſed to ſwim if Mucus, and to ſink if Pus; the fallacy of this is ſuſpected, when we know, that the Mucus of thoſe parts, where air has not acceſs to it, always ſinks, as of the urethra and ſtomach; but is proved beyond a doubt by extracting the air from pulmonary Mucus, ſince after that it will (*a*) ſink ; add to this, that Mucus and Pus may be mixed in ſuch proportions, and ſo united to air bubbles, as to float upon the ſurface of water. This teſt, as at preſent uſed, is not ſo good as it was in the method originally adviſed by (*b*) Hippocrates ; he ordered, that the expectorated matter ſhould be received into ſea-water, which from its greater ſpecific gravity, will be a more probable teſt of the preſence of Pus ; but as Van Swieton juſtly obſerves, (*c*) the fallaciouſneſs of this teſt fully appears, from ſome part of the ſame expectorated matter ſwimming, and ſome ſinking ; and from that, which had ſwam in the morning, if allowed to remain in the ſame circumſtances, ſinking in the evening. Was any thing more required to overturn the uſe of this, as a proof of the preſence of Pus ; I think, we might lay conſiderable ſtreſs on the contradictions, which occur, even in the works of the father of medicine, on this ſubject ; in the paſſage above quoted, he mentions the ſinking in ſea-water as

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(*a*) Fordice de catarrho. Exp. 16. Theſ. Edinens. 1758.

(*b*) Coac. prænot. No. 435. Tom. I. p. 565. Editionis Varder, Leiden, 1665.

(*c*) Comment. in Boerhaav. Aph. Tom. IV, p. 71. Aph. 1206.

as fatal; and in another, the frothyneſs of the ſputum is enumerated as a fatal ſign. (*d*)

SOME have paid much attention to the colour of the matter expectorated, as Hippocrates does, in the following paſſages; if, ſays he, long after the commencement of the pain of the breaſt, the expectorated matter be yellow, or tawny, or mix'd, it is bad; if it is ſimply yellow, it is alſo dangerous; that which is green, is alſo bad; likewiſe ſuch as is pale and frothy: but if it is quite black, it is moſt (*e*) dangerous. And he deſcribes the good PUS, (*f*) as white, ſmooth, and uniform; whilſt Celſus, however, is of a contrary opinion to Hippocrates, and ſays, Quanto magis miſtos neque inter ſe diductos colores habet tanto deterius. Lib. 2. Cap 8. but every perſon, who has with any attention obſerved the common terminations of a catarrh or coryza, will have ſeen almoſt the whole of theſe ſymptoms occur from the changes of the mucus. The black appearance ſeems to be the only unuſual one, and that may probably (if it is ſo fatal as repreſented) be a ſymptom of incipient gangrene; tho'

(*d*) Coac. præno. 207. Tom. I. p. 562.
præ**n**ot. XIII. 7. Tom. I. p. 458.

(*e*) Prænot. XIII. 7. Tom I. p. 458.

(*f*) Prædictor. Lib. 2. Sect. 12. No. 2. Tom. I. p. 457.

tho' I have known a perſon, who has for ſome years ſpit up every morning a ſmall quantity of black matter, and yet has enjoyed a perfect ſtate of health; a bluiſh kind of matter is very frequently thus ſpit up.

HIPPOCRATES, and ſome others have alſo ennumerated the fœted ſmell of ſuch matter as a bad ſymptom; either when expectorated or burnt on (*g*) hot coals; my reaſons for not paying implicit credit to the firſt, are, that PUS has often no (*h*) bad ſmell; and that diſagreeable ſmells frequently occur at ſome period of a common catarrh or coryza. With reſpect to the ſecond, I am fully authorized to doubt by Van Swieton, when he gives the opinion of (*i*) Benedict: That the taſte of expectorated matter is of no great importance, is evinced, becauſe ſome affirm a ſaline taſte to be bad, ſome a ſweet, and others a diſagreeable one not to be diſcribed.

HECTIC fever may be conſidered as a criterion of the preſence of PUS; but independent of the reaſons, which might be drawn from the arguments of Mr. John Hunter, (who

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(*g*) Sect. 5. Apho. 11.

(*h*) Hendy, de ſecretione glandulari. Theſ. Edin. 1774. Experim. I.

(*i*) Vol. 4. p. 73.

(who has endeavoured to prove, that the hectic fever in ulcers depends alone on the loſs of matter from the general ſyſtem, and the irritation of the part,) I think this teſt will often fail us, in caſes where a diſtinction is of the utmoſt importance: As when a patient has catarrhal or phthiſical ſymptoms, and at the ſame time a white ſwelling of a joint, or other conſiderable topical affection; the ſtate of the lungs may merit ſome attention, previous to the determining on any operation.

THUS having mentioned the commonly received modes of diſtinction, and their fallacy, I ſhall relate the experiments from whence I have endeavour'd to deduce a new, and, I hope, a more certain teſt than any of the former. They are numbered, as are the obſervations diſperſed in them, for the convenience of future reference.

EXPERIMENT, I.

I. EXPERIMENT.

To a dram of very ſœtid *purulent matter*, obtained from a common abſceſs, fifty drops of *vitrolic acid* were added: The acid ſunk to the bottom, while the purulent matter kept in the upper part of the glaſs; but, on the addition of about two ounces of water, the whole formed a turbid white *uniform mixture*.

II. EXPERIMENT.

About fifty drops of *vitrolic acid* were added to a dram of *mucus*, coughed up from the lungs, and diſcharged from the noſe; the acid ſoon diſſolved the greateſt part of the mucus, but, on a proportion of water being added to the mixture, the mucus, which had been diſſolved, *ſwam on the top* of the fluid.

III. EXPERIMENT.

To fifty drops of *vitrolic acid*, diluted with about an ounce of water, were added about two drams of pure *mucus*, coughed up from the lungs, and collected from the noſe; notwithſtanding repeated agitation, they could not be made to unite;— almoſt the whole mucus continued *afloat at the top*; and the watery fluid below loſt very little of its tranſparency, acquiring only a ſlight bluiſh caſt.

OBSERVATIONS, on I. II. and III. EXPERIMENTS.

It will ſometimes happen, that mucus may be ſeparated in the form of a ſlight ſediment, on adding water, or enter into the weak acid; but then, in both caſes, it is in large flocci, and cannot be made to form an uniform turbid ſolution.

IV. EXPERIMENT.

On the addition of about two drams of fœtid *purulent matter*, to fifty drops of *vitriolic acid*, diluted with about an ounce of water, an *uniform turbid fluid* of a whitiſh colour was formed, and which exactly reſembled that mentioned in the firſt experiment.

V. EXPERIMENT.

About two drams of very fœtid *purulent matter* were combined by agitation with as much *mucus* from the noſe and lungs. Theſe two fluids were ſo blended together, that no difference could be perceived. To this was added a mixture of fifty drops of *vitriolic* *acid* with two ounces of water. In a ſhort time the fluid in the under part of the glaſs had the ſame turbid appearance as in experiment firſt and fourth, while the mucus apparently deprived of purulent matter ſwam on the top.

VI. OBSERVATION.

All the five glaſſes mentioned in the preceeding experiments, were allowed to remain at reſt about half an hour, during that time the glaſſes mentioned in experiments, ſecond and third, which contained the mucus, remained unchanged. But the firſt, fourth and fifth depoſited each a white coloured ſediment in conſiderable quantity; the fluid above the ſediment in firſt and fourth had become ſomewhat more tranſparent, but ſtill continued of a white colour. In the fifth the mucus continued to float on the ſurface as before.

VII. EXPERIMENT.

The *mucus* collected from the top of the fifth was put into another glaſs, and an ounce of water impregnated with fifty drops of *cauſtic alkaline* lixivium (*k*) was added; but *no union* or ſolution could be produced even by the aid of triture.

VIII.

(*k*) Pharmacop. Edinens.

VIII. EXPERIMENT.

FIFTY drops of the *alkaline lixivium* were added to each of the phials No. 1, 2, 3, and 4, when 1 and 4 were agitated, the white ſediment was again diffuſed in them; but, in a ſhort time it ſubſided, leaving the liquor above of the ſame whitiſh colour as before the addition; the agitation of 2 and 3 had no effect in producing any union farther than before; the mucus in both ſtill continuing to float on the ſurface.

IX. EXPERIMENT.

THE *mucus* uſed in 7 and 8 was again put into a glaſs by itſelf, and about two drams of *cauſtic alkaline* lixivium added to it. In this by the aid of agitation it was ſoon *completely diſſolved*, loſing entirely its viſcidity, and leaving a froth on the top.

X. EXPERIMENT.

TWO ounces of water added to the ſolution of *mucus in alkali* No. 9, produced no decompoſition; and had the effect only of giving the fluid a greater tranſparency; no change was produced on this fluid, when allowed to remain at reſt for the ſpace of half an hour, except that the froth on the ſurface diſappeared.

XI. EXPERIMENT.

To half the liquor of 10, about a dram of *nitrous acid* was added; the mixture became of a more turbid and white colour, but no depoſition took place.

XII. EXPERIMENT.

A ſimilar change of colour took place on the addition of a certain quantity of the *muriatic acid* to the remaining half of No. 10. But, even after the mixture had ſtood for half an hour, no ſediment had fallen to the bottom of the veſſel.

XIII. EXPERIMENT.

When the white coloured liquor on the ſurface was poured off from No. 1, 4, and 5, each of which depoſited a ſediment reſembling *pus*. The ſediments were again obſerved to emit a very fœtid ſmell. To theſe ſediments collected in one glaſs, about two drams of *nitrous acid* were added. The mixture for a little time appeared uniform, but in a few minutes a thick white cloud was obſerved on the top of it, the liquor below being of a wheyiſh colour.

XIV. EXPERIMENT.

To the liquor, No. 13, was added about two ounces of water: The cloud which before ſwam on the ſurface, was on ſlight agitation, uniformly diffuſed through it; and when the mixture was allowed to remain at reſt for a ſhort time, a ſediment fell to the bottom exactly reſembling that which had appeared in obſervation 6, to have happened in experiment 1, 4, and 5; and this ſediment, when the fluid above was poured off, had alſo a fœtid ſmell.

XV. EXPERIMENT.

Two ounces of viſcid *mucus*, blown from the noſe, were put into a glaſs, to theſe were added two drams of *alkaline lixivium*, a *complete ſolution* ſoon took place; and upon the addition of two ounces of water, there did not occur any ſeparation. The glaſs was allowed to remain at reſt for the ſpace of a fortnight, and during that time a very ſlight ſeparation only had taken place; which conſiſted ſolely of light flakes of mucus ſwimming in the water; but nothing appeared in the bottom of the glaſs, which could in the leaſt degree deſerve the name of ſediment. Previous to making this and the preceding experiments, it is neceſſary to examine the water to be uſed, as I once was ſurprized to ſee a conſiderable cloud, and then a ſediment occur on adding water to mucus and alkaline lixivium; but I ſoon diſcovered that this was owing to the impurity of the water added. Alſo in conducting this experiment, we muſt let the mucus and the alkaline lixivium remain at leaſt an hour united, before we add the water; and if we obſerve any mucus undiſſolved by the alkali, it ſhould be removed before we add the water.

N. B. In ſome repetitions of theſe experiments I have ſeen a ſlight cloud in the ſpace of twelve hours, but never immediately.

XVI. EXPERIMENT

Two drams of *purulent matter*, obtained in the opening of a large abſceſs, were put into a glaſs, and agitated with about as much of the *alkaline cauſtic* lixivium; in a ſhort time there was an intimate mixture, and the pus ſeem'd to be diſſolved. But upon the addition of water a ſeparation took place, and in a few minutes a conſiderable ſediment, apparently of purulent matter, ſunk to the bottom. When allowed to remain at reſt, it continued in this condition for ſeveral days: But at the end of a fortnight, what had at firſt appeared as a ſediment floated in the ſurrounding fluid.

N. B. It will ſome times be difficult to unite the pus and alkali.— See Experiment the 32.

XVII. EXPERIMENT.

To a ſmall quantity of *coagulable lymph*, obtained by waſhing away the red globules from ſome craſſamentum of blood, I added about fifty drops of *acid* of *vitriol*; which changed the colour of the lymph to a reddiſh brown, but did not apparently diſſolve any of it.

XVIII. EXPERIMENT.

To No. XVII. about an ounce of water was added without producing any obſervable change in the fluid, but the lymph after this ſeemed more denſe than before Experiment the XVII.

XIX. EXPERIMENT.

One dram of *cauſtic lixivium* took five hours to diſſolve the greater part of four grains of *coagulable lymph* ; the remainder of the lymph had acquired a brown red colour, and was ſofter than before it was added to the alkali.

XX. EXPERIMENT.

Water added to XIX. produced a ſeparation of a whitiſh ſediment.

XXI. EXPERIMENT.

Equal parts of *ſerum* and *cauſtic lixivium* eaſily united, and ſuffered no change on the addition of eight or ten times their quantity of water; tho after ſtanding ſome hours the mixture depoſited a ſlight ſediment.

XXII. EXPERIMENT.

Twenty five drops of *vitriolic acid* added to one dram of *ſerum* converted it into a whitiſh curdled matter.

XXIII. EXPERIMENT.

WATER being added to No. 22, the whitiſh curdled matter was eaſily diſperſed through it; but ſoon formed a cloud near the top of the glaſs: On the addition of more ſerum to this mixture, it was converted into a ſimilar matter.

XXIV. EXPERIMENT.

ONE dram of *nitrous acid*, after ſome time, diſſolved 3 grains of *coagulable lymph*, with fumes and froth.

XXV. EXPERIMENT.

WATER added to this produced a dilute *green fluid*.

XXVI. EXPERIMENT.

Acid of nitre diſſolved *mucus*, and with water occaſioned a turbid dirty coloured fluid.

XXVII. EXPERIMENT.

A ſaturated ſolution of *corroſive ſublimate* coagulated *mucus* into an harder white material.

XXVIII. EXPERIMENT.

(This and the following experiments were tried on Pus from a ſuppurated mamma.) *Pus* diffuſed readily thro' *pure water*, forming a white milky opake fluid, but after ſome length of time fell down to the bottom of the glaſs; where it had no great viſcidity; the fluid above it was for ſome hours of a reddiſh yellow colour, but became at laſt colourleſs; by agitation the pus was again diffuſible, but did not remain ſo long ſuſpended as the firſt time; and the fluid was immediately after its precipitation clear and colourleſs.

XXIX. EXPERIMENT.

Acid of vitriol in ſmall quantity exhibited the ſame appearances with this *pus* fiom a ſuppurated mama, as in No. 1, &c.

XXX. EXPERIMENT.

Acid of vitriol in large quantity diſſolved it, and became black; on adding four or five times its quantity of water it grew turbid; and in an hour let fall a copious browniſh heavy ſediment, the fluid above being nearly colourleſs.

XXXI. EXPERIMENT.

Nitrous acid in conſiderable quantity diſſolved it with great froth; became *green*, and kept its froth; water added rendered it very turbid and milky; and a copious white ſediment ſoon fell to the bottom, the fluid above remaining green, and having ſtill the froth.

XXXII. EXPERIMENT.

Cauſtic alkaline lixivium would not diſſolve it, for it remained viſcid at the bottom of a glaſs of lixivium, and nearly ſeparable for the ſpace of twenty four hours; on adding water to this a ſemipellucid matter fell to the bottom, (which was more viſcid and tough, and readily drawing into ſtrings, than the pus before the addition,) and could not be ſeparated into parts; nor in the leaſt diffuſed thro' the water. See 15, 18, and 34.

N. B. This experiment I repeated five times with the ſame event, I uſed great agitation, a lixivium of double (*l*) ſtrength, and different proportions of it to the pus, and water to the compound.

(*l*) i. e. Containing double the uſual quantity of cauſtic alkali in a given meaſure.

XXXIII. EXPERIMENT.

A ſaturated ſolution of *corroſive ſublimate* produced no evident change; but allowed on the addition of water a milky diffuſion; in ſome little time a ſediment fell, and left a fluid. See 28.

XXXIV. EXPERIMENT.

SOME *cauſtic alkaline* lixivium; added to a mixture of pus and water, from its being milky and opake made it dirty coloured and ſemipellucid; and produced after a time a ſlight tough precipitate, the fluid above remaining muddy, and not becoming clear on ſtanding. See 28.

XXXV. EXPERIMENT.

Pus was diffuſed thro' a ſaturated ſolution of *ſea ſalt* in water, but ſoon depoſited in the form of a tough precipitate. See 28.

FROM the above related experments I think the following concluſions may juſtly be deduced.

1. Pus and mucus are both ſoluable in the vitriolic acid, tho in very different proportions, pus being much the leſs ſoluable. 2, 30, 1, 29.

2. The addition of water to either of theſe compounds decompoſes it; the mucus thus ſeparated, either ſwims on the mixture, or forms large flocci in it; whereas the pus falls to the bottom, and forms on agitation a uniform turbid mixture. 2, 1. 6, 30, 5, &c.

3. Pus is diffuſible thro' a diluted vitriolic acid, tho mucus is not; the ſame occurs with water, or a ſolution of ſea ſalt. 3, 4, 5, 28, 35.

4. Nitrous acid diſſolves both pus and mucus; water added to the ſolution of pus produces a precipitate; and the fluid above becomes clear and green; while water and the ſolution of mucus form a dirty coloured fluid. 31, 24, 5.

5. Alkaline lixivium diſſolves (tho ſometimes with difficulty) mucus, and generally pus.

6. Water precipitates pus from ſuch a ſolution, but does not mucus. 9, 15, 16.

7. Where alkaline lixivium does not diſſolve pus, it ſtill diſtinguiſhes it from mucus; as it then prevents it's diffuſion thro' water. 32.

8. Coagulable lymph is neither ſoluble in diluted nor concentrated vitriolic acid. 17, 18.

9. Water produces no change on a ſolution of ſerum in alkaline lixivium, until after long ſtanding, and then only a very ſlight ſediment appears. 21.

10. Corroſive ſublimate coagulates mucus, but does not pus.

FROM the above experiments it appears, that *ſtrong vitriolic acid and water*; *diluted vitriolic acid*; and *cauſtic alkaline lixivium and water* will ſerve to diſtinguiſh PUS from MUCUS; that the vitriolic acid can ſeparate it from coagulable lymph, and alkaline lixivium from ſerum.

AND hence when a perſon has any expectorated material, the compoſition of which he wiſhes to aſcertain, let him diſſolve it in vitriolic acid, and in cauſtic alkaline lixivium; and then add pure water to both ſolutions: and if there is a fair precipitation in each, he may be aſſured that ſome PUS is preſent; if in neither a precipitation occurs, it is a certain teſt, that the material is entirely MUCUS: if the material cannot be made to diſſolve in alkaline lixivium by time and trituration, we have alſo reaſon to believe that it is PUS.

THUS having finiſhed the taſk I had undertaken, I hope, ſhould I fail of obtaining the honour of your medal, theſe experiments may be of ſome ſervice, as corroborating any better teſt, which may be preſented to you; ſhould I ſucceed, I need not ſay, that gratitude will always bind me to the Æſculapian ſociety, and that I ſhall be happy in having contributed my mite to aſcertain an important circumſtance in the practice of medicine.

* * *

AN ACCOUNT

OF THE

RETROGRADE MOTIONS

OF THE

ABSORBENT VESSELS

OF

ANIMAL BODIES

IN SOME DISEASES.

Advertiſement.

THE following diſſertation was written in claſſical latin, by the late Mr. CHARLES DARWIN, and was deſigned for his inaugural theſis: it is here faithfully tranſlated into engliſh.

CONTENTS.

I. ACCOUNT of the abſorbent ſyſtem.

II. The valves of the abſorbent veſſels may ſuffer their fluids to regurgitate in ſome diſeaſes.

III. Communication from the alimentary canal to the bladder by means of the abſorbent veſſels.

IV. The phœnomena of diabætes explained.

V. The phœnomena of dropſies explained.

VI. Of cold ſweats.

VII. Tranſlations of matter, of chyle, of milk, of urine, operation of purging drugs applied externally.

VIII.

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VIII. Circumſtances by which the fluids, that are effuſed by the retrograde motions of the abſorbent veſſels, are diſtinguiſhed.

IX. Synopſis of diſeaſes, which originate from the retrograde motions of the abſorbent veſſels.

X. Objections anſwered.

XI. The cauſes, which induce the retrograde motions of animal veſſels, and the medecines by which the natural motions are reſtored.

AN ACCOUNT
OF THE
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ANIMAL BODIES
IN SOME DISEASES.

THE progreſs of our knowlege in the art of healing, has frequently been retarded by idle theories; in which the laws of animal life have been compared with thoſe of mechanics or of chemiſtry. In the ſubſequent pages I have endeavoured to avoid this error, by comparing animal facts with other animal facts; and that without introducing any chemical or mechanical alluſions; as this ſtricter kind of analogy is, perhaps, the only ſafe foundation for medical reaſoning.

I. *Account of the abſorbent ſyſtem.*

1. THE abſorbent ſyſtem of veſſels in animal bodies conſiſts of ſeveral branches, differing in reſpect to their ſituations, and to the fluids which they abſorb.

THE *inteſtinal abſorbents* open their mouths on the internal ſurfaces of the inteſtines; their office is to drink up the chyle and the other fluids from the alimentary canal; and they are term'd *lacteals,* to diſtinguiſh them from the other abſorbent veſſels, which have been term'd *lymphatics.*

THOSE, whoſe mouths are diſperſed on the external ſkin, imbibe a great quantity of water from the atmoſphere, and a part of the perſpirable matter, which does not evaporate, and are term'd *cutaneous abſorbents.*

THOSE, which ariſe from the internal ſurface of the bronchia, and which imbibe moiſture from the atmoſphere, and a part of the bronchial mucus, are call'd *pulmonary abſorbents.*

THOSE, which open their innumerable mouths into the cells of the whole cellular membrane; and whoſe uſe is to take up the fluid, which is pour'd into thoſe cells, after it has done it's office there; may be call'd *cellular abſorbents.*

THOSE, which ariſe from the internal ſurfaces of the membranes, which line the larger cavities of the body, as the thorax, abdomen, ſcrotum, pericardium, take up the mucus pour'd into thoſe cavities; and are diſtinguiſh'd by the names of their reſpective cavities.

WHILST thoſe, which ariſe from the internal ſurfaces of the urinary bladder, gall-bladder, ſalivary ducts, or other receptacles of ſecreted fluids, may take their names from thoſe fluids; the thinner parts of which it is their office to abſorb: as *urinary, bilious,* or *ſalivary abſorbents.*

2. MANY of theſe abſorbent veſſels, both lacteals and lymphatics, like ſome of the veins, are replete with *valves:* which ſeem deſigned to aſſiſt the progreſs of their fluids, or at leaſt to prevent their regurgitation; where they are ſubjected to the intermitted preſſure of the muſcular, or arterial actions in their neighbourhood.

THESE valves do not however appear to be neceſſary to all the abſorbents, any more than to all the veins; ſince they are not found to exiſt in the abſorbent ſyſtem of fiſh; according to the diſcoveries of the ingenious, and much lamented Mr. HEWSON. Philoſ. Tranſact. V. 59, Enquiries into the lymph. ſyſt. p. 94.

3. THESE abſorbent veſſels are alſo furniſhed with glands, which are called *conglobate glands*; whoſe uſe is not at preſent ſufficiently inveſtigated; but it is probable that they reſemble the conglomerate glands both in ſtructure and in uſe, except that their abſorbent mouths are for the conveniency of ſituation placed at a greater diſtance from the body of the gland. The conglomerate glands open their mouths immediately into the ſanguiferous veſſels, which bring the blood, from whence they abſorb their reſpective fluids, quite up to the gland: but theſe conglobate glands collect their adapted fluids from very diſtant membranes, or cyſts, by means of mouths furniſh'd with long necks for this purpoſe; and which are call'd lacteals, or lymphatics.

4. The fluids thus collected from various parts of the body, paſs by means of the thoracic duct, into the *left ſubclavian*, near the jugular vein; except, indeed, that thoſe collected from the right ſide of the head and neck, and from the right arm, are carried into the right ſubclavian vein: and ſometimes even the lymphatics, from the right ſide of the lungs, are inſerted into the right ſubclavian vein; whilſt thoſe of the left ſide of the head, open but juſt into the ſummit of the thoracic duct.

5. In the abſorbent ſyſtem there are many *anaſtomoſes of the veſſels*, which ſeem of great conſequence to the preſervation of health. Theſe anaſtomoſes are diſcovered by diſſection, to be very frequent between the inteſtinal and urinary lymphatics, as mentioned by Mr. *Hewſon*, (Phil. Tranſ. v. 58).

6. Nor do all the inteſtinal abſorbents ſeem to terminate in the *thoracic duct*, as appears from ſome curious experiments of Dr. *Monro*, who gave madder to ſome animals, having previouſly put a ligature on the thoracic duct, and found their bones, and the ſerum of their blood, coloured red.

II. The valves of the abſorbent ſyſtem may ſuffer their fluids to regurgitate in ſome diſeaſes.

1. THE many valves, which occur in the progreſs of the lymphatic and lacteal veſſels, would ſeem inſuperable obſtacles to the regurgitation of their contents. But as *theſe valves are placed in veſſels, which are indued with life, and are themſelves indued with life alſo*; and are very irritable into thoſe natural motions, which abſorb, or propel the fluids they contain; it is poſſible, in ſome diſeaſes, where theſe valves or veſſels are ſtimulated into unnatural exertions, or are become paralytic, that during the diaſtole of the part of the veſſel to which the valve is attached, the valve may not ſo completely cloſe, as to prevent the relapſe of the lymph or chyle. This is rendered more probable, by the experiments of injecting mercury, or water, or ſuet, or by blowing air down theſe veſſels; all which paſs the valves very eaſily, contrary to the natural courſe of their fluids, when the veſſels are thus a little forcibly

dilated, as mentioned by Dr. *Haller*, Elem. Phyſiol. l. 3, ſ. 4.

2. THE mouths of the lymphatics ſeem to admit water to paſs through them after death, the inverted way, eaſier than the natural one; ſince an inverted bladder readily lets out the water with which it is filled; whence it may be inferred, that there is *no obſtacle at the mouths of theſe veſſels* to prevent the regurgitation of their contained fluids.

I WAS induced to repeat this experiment, and having accurately tied the ureters and neck of a freſh ox's bladder, I made an opening at the fundus of it; and then, having turned it inſide outwards, filled it half full with water, and was ſurprized to ſee it empty itſelf ſo haſtily. I thought the experiment more appoſite to my purpoſe by ſuſpending the bladder with its neck downwards, as the lymphatics are chiefly ſpread upon this part of it; as ſhewn by Dr. *Watſon*, Philoſ. Tranſ. v, 59, p. 392.

3. IN ſome diſeaſes, as in the diabætes and ſcrophula, it is probable *the valves themſelves are diſeaſed*, and are thence incapable of preventing the return of the fluids they

ſhould ſupport. Thus the valves of the aorta itſelf have frequently been found ſchirrous, according to the diſſections of Monſ. *Lieutaud*, and have given riſe to an interrupted pulſe, and laborious palpitations, by ſuffering a return of part of the blood into the heart. Nor are any parts of the body ſo liable to ſchirroſity as the lymphatic glands and veſſels, inſomuch that their ſchirroſities have acquired a diſtinct name, and been termed ſchrophula.

4. THERE are valves in other parts of the body, analogous to thoſe of the abſorbent ſyſtem, and which are liable, when diſeaſed, to regurgitate their contents: thus the upper and lower *orifices of the ſtomach are cloſed by valves*, which, when too great quantities of warm water have been drank with a deſign to promote vomiting, have ſometimes reſiſted the utmoſt efforts of the abdominal muſcles, and diaphragm: yet, at other times, the upper valve, or cardia, eaſily permits the evacuation of the contents of the ſtomach; whilſt the inferior valve, or pylorus, permits the bile, and other contents of the duodenum, to regurgitate into the ſtomach.

5. The *valve of the colon* is well adapted to prevent the retrograde motion of the excrements; yet, as this valve is poſſeſſed of a living power, in the iliac paſſion, either from ſpaſm, or other unnatural exertions, it keeps itſelf open, and either ſuffers, or promotes the retrograde movements of the contents of the inteſtines below; as in ruminating animals the mouth of the firſt ſtomach ſeems to be ſo conſtructed, as to facilitate or aſſiſt the regurgitation of the food; the rings of the œſophagus afterwards contracting themſelves in inverted order. *De Haen*, by means of a ſyringe, forced ſo much water into the rectum inteſtinum of a dog, that he vomited it in a full ſtream from his mouth; and in the iliac paſſion above mentioned, excrements and clyſter are often evacuated by the mouth.

6. *THE puncta lacrymalia*, with the lacrymal ſack and naſal duct, compoſe a complete gland, and much reſemble the inteſtinal canal: the puncta lacrymalia are abſorbent mouths, that take up the tears from the eye, when they have done their office there, and convey them into the noſtrils; but when the naſal duct is obſtructed, and

the lacrymal ſack diſtended with its fluid, on preſſure with the finger the mouths of this gland (puncta lacrymalia) will readily diſgorge the fluid, they had previouſly abſorbed, back into the eye.

7. As the capillary veſſels receive blood from the arteries, and ſeparating the mucus, or perſpirable matter from it, convey the remainder back by the veins; theſe *capillary veſſels are a ſet of glands*, in every reſpect ſimilar to the ſecretory veſſels of the liver, or other large congeries of glands. The beginnings of theſe capillary veſſels have frequent anaſtomoſes into each other, in which circumſtance they are reſembled by the lacteals; and like the mouths or beginnings of other glands, they are a ſet of abſorbent veſſels, which drink up the blood which is brought to them by the arteries, as the chyle is drank up by the lacteals: for the circulation of the blood through the capillaries is proved to be independent of arterial impulſe; ſince in the bluſh of ſhame, and in partial inflammations, their action is increaſed, without any increaſe of the motion of the heart.

8. Yet not only the mouths, or beginnings of theſe anaſtomoſing capillaries are frequently ſeen by microſcopes, to regurgitate ſome particles of blood, during the ſtruggles of the animal; but *retrograde motion of the blood*, in the veins of theſe animals, from the very heart to the extremity of the limbs, is obſervable, by intervals, during the diſtreſſes of the dying creature, Haller. Elem. Phyſiol. t. i, p. 216. Now, as the veins have perhaps all of them a valve, ſomewhere between their extremities and the heart, here is ocular demonſtration of the fluids in this diſeaſed condition of the animal, repaſſing through venous valves: and it is hence highly probable, from the ſtricteſt analogy, that if the courſe of the fluids, in the lymphatic veſſels, could be ſubjected to microſcopic obſervation, they would alſo, in the diſeaſed ſtate of the animal, be ſeen to repaſs the valves, and the mouths of thoſe veſſels, which had previouſly abſorbed them, or promoted their progreſſion.

III. *Communication from the alimentary canal to the bladder, by means of the abſorbent veſſels.*

MANY medical philoſophers, both ancient and modern, have ſuſpected that there was a nearer communication between the ſtomach and the urinary bladder, than that of the circulation: they were led into this opinion from the great expedition with which cold water, when drank to exceſs, paſſes off by the bladder; and from the ſimiliarity of the urine, when produced in this haſty manner, with the material that was drank.

THE former of theſe circumſtances happens perpetually to thoſe, who drink abundance of cold water, when they are much heated by exerciſe; and to many at the beginning of intoxication.

OF the latter, many inſtances are recorded by *Etmuller*, t. xi, p. 716. where ſimple water, wine, and wine with ſugar, and emulſions, were returned, by urine, unchanged.

THERE are other experiments, that ſeem to demonſtrate the exiſtance of another paſſage to the bladder, beſides that through the kidneys. Thus Dr. *Kratzenſtein* put ligatures on the ureters of a dog, and then emptied the bladder by a catheter; yet in a little time the dog drank greedily, and made a quantity of water (Diſputat. Morbor. Halleri. t. iv, p. 63). A ſimilar experiment is related in the philoſophical tranſactions, with the ſame event, (No. 65, 67, for the year 1670).

ADD to this, that in ſome morbid caſes the urine has continued to paſs, after the ſuppuration or total deſtruction of the kidneys; of which many inſtances are referred too in the El. Phyſiol. t. vii, p. 379, of Doctor *Haller*.

FROM all which it muſt be concluded, that ſome fluids have paſſed from the ſtomach or abdomen, without having gone through the ſanguiferous circulation: and as the bladder is ſupplied with many lymphatics, as deſcribed by Dr. *Watſon*, in the Philoſ. Tranſ. v. 59, p. 392; and as no other veſſels open into it beſides theſe and the ureters, it ſeems evident, that the unnatural urine, produced as above deſcribed, when the ureters were tied, or the kidneys obliterated, was carried into the bladder by the retrograde motions of the urinary branch of the lymphatic ſyſtem.

The more certainly to aſcertain the exiſtence of another communication between the ſtomach and bladder, beſides that of the circulation, the following experiment was made, to which I muſt beg your patient attention:—A friend of mine (*June* 14th, 1772) on drinking repeatedly of cold ſmall punch, till he began to be intoxicated, made a quantity of colourleſs urine. He then drank about two drams of nitre diſſolved in ſome of the punch, and eat about twenty ſtalks of boiled aſparagus: on continuing to drink more of the punch, the next urine that he made was quite clear, and without ſmell; but in a little time another quantity was made, which was not quite ſo colourleſs, and had a ſtrong ſmell of the aſparagus: he then loſt about four ounces of blood from the arm.

The ſmell of aſparagus was not at all perceptible in the blood, neither when freſh taken, nor the next morning, as myſelf and two others accurately attended to; yet this ſmell was ſtrongly perceived in the urine, which was made juſt before the blood was taken from his arm.

Some bibulous paper, moiſtened in the ſerum of this blood, and ſuffered to dry, ſhewed no ſigns of nitre by its manner of burning. But ſome of the ſame paper, moiſtened in the urine, and dryed, on being ignited, evidently ſhewed the preſence of nitre. This blood and the urine ſtood ſome days expoſed to the ſun in the open air, till they were evaporated to about a fourth of their original quantity, and began to ſtink: the paper, which was then moiſtened with the concentrated urine, ſhewed the preſence of much nitre by its manner of burning; whilſt that moiſtened with the blood, ſhewed no ſuch appearance at all.

Hence it appears, that certain fluids at the beginning of intoxication, find another paſſage to the bladder, beſides the long courſe of the arterial circulation; and as the inteſtinal abſorbents are joined with the urinary lymphatics by frequent anaſtomoſes, as *Hewſon* has demonſtrated; and as there is no other road, we may juſtly conclude, that theſe fluids paſs into the bladder by the urinary branch of the lymphatics, which has its motions inverted during the diſeaſed ſtate of the animal.

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IV. *The phœnomena of the diabætes explained, and of ſome diarrhœas.*

THE phœnomena of many diſeaſes are only explicable from the retrograde motions of ſome of the branches of the lymphatic ſyſtem; as the great and immediate flow of pale urine in the beginning of drunkenneſs; in hyſteric paroxyſms; from being expoſed to cold air; or to the influence of fear or anxiety.

BEFORE we endeavour to illuſtrate this doctrine, by deſcribing the phœnomena of diſeaſes, we muſt premiſe one circumſtance; that all *the branches of the lymphatic ſyſtem have a certain ſympathy with each other*, inſomuch that when one branch is ſtimulated into unuſual kinds, or quantities of motion, ſome other branch has its motions either increaſed, or decreaſed, or inverted at the ſame time. This kind of ſympathy can only be proved by the concurrent teſtimony of numerous facts, which will be related in the courſe of this diſſertation: I ſhall only add here, that it is probable, that this ſympathy does not depend on any communication of nervous filaments, but on habit; owing to the various branches of this ſyſtem having frequently been ſtimulated into action at the ſame time. This habit of acting, either together or in ſucceſſion, is termed by the metaphyſicians, *aſſociation*; and in this manner not only many of the movements of the body, but the ideas of the mind are connected together, as appears from the celebrated writings of *Locke* and *Hartley*; and which I ſhall endeavour further to illuſtrate at ſome future time, if Heaven ſhould grant me life and ability!

THERE are a thouſand inſtances of involuntary motions aſſociated in this manner; as in the act of vomiting, while the motions of the ſtomach and æſophagus are inverted, the pulſations of the arterial ſyſtem by a certain ſympathy become weaker; and when the bowels, or kidneys are ſtimulated by poiſon, a ſtone, or inflammation, into more violent action; the ſtomach and æſophagus by a ſympathy unexplained invert their motions.

1. When any one drinks a moderate quantity of vinous ſpirit, the whole ſyſtem acts with more energy by conſent with the ſtomach and inteſtines, as is ſeen from the glow on the ſkin, and the increaſe of ſtrength and activity; but when a greater quantity of this inebriating material is drank, at the ſame time that the lacteals are excited into greater action to abſorb it; it frequently happens, that the urinary branch of abſorbents, which is connected with the lacteals by many anaſtomoſes, inverts its motions, and a great quantity of pale unanimalized urine is diſcharged. By this wiſe contrivance too much of an unneceſſary fluid is prevented from entering the circulation—This may be called the *drunken diabætes*, to diſtinguiſh it from the other temporary diabætes, which occur in hyſteric diſeaſes, and from continued fear or anxiety.

2. If this idle ingurgitation of too much vinous ſpirit be daily practiced, the urinary branch of abſorbents at length gains an habit of inverting its motions, whenever the lacteals are much ſtimulated; and the whole or a great part of the chyle is thus daily carried to the bladder without entering the

circulation, and the body becomes emaciated. This is one kind of chronic diabætes, and may be diſtinguiſhed from the others by the taſte and appearance of the urine; which is ſweet, and the colour of whey, and may be termed the *chyliſerous diabætes.*

3. MANY children have a ſimilar depoſition of chyle in their urine, from the *irritation of worms* in their inteſtines, which ſtimulating the mouths of the lacteals into unnatural action, the urinary branch of the abſorbents becomes inverted, and carries part of the chyle to the bladder: part of the chyle alſo has been carried to the iliac and lumber glands, of which inſtances are recorded by *Haller*, t. vii, 225, and which can be explained on no other theory: but the diſſections of the lymphatic ſyſtem of the human body, which have yet been publiſhed, are not ſufficiently extenſive for our purpoſe; yet if we may reaſon from comparative anatomy, this tranſlation of chyle to the bladder, is much illuſtrated by the account given of this ſyſtem of veſſels in a turtle, by Mr. *Hewſon*, who obſerved, " That the lacteals near the root of the meſentery anaſtomoſe, ſo as to form a net-work, from which ſeveral

large branches go into ſome conſiderable lymphatics lying near the ſpine; and which can be traced almoſt to the anus, and particularly to the kidneys. Philoſ. Tranſ. v. 59, p. 199--enquiries p. 74.

4. At the ſame time that the urinary branch of abſorbents, in the beginning of diabætes, is excited into inverted action, the cellular branch is excited by the ſympathy above-mentioned, into more energetic action; and the fat, that was before depoſited, is re-abſorbed, and thrown into the blood veſſels; where it floats, and was miſtaken for chyle, 'till the late experiments of the ingenious Mr. *Hewſon*, demonſtrated it to be fat.

This appearance of what was miſtaken for chyle in the blood, which was drawn from theſe patients, and the obſtructed liver, which very frequently accompanies this diſeaſe, ſeems to have led Dr. *Mead* to ſuſpect the diabætes was owing to a defect of ſanguification; and that the ſchirroſity of the liver was the original cauſe of it: but as the ſchirrhus of the liver is moſt frequently owing to the ſame cauſes, that produce the diabætes and dropſies; namely, the great uſe of fermented liquors; there is no wonder they ſhould exiſt together, without being the conſequence of each other.

5. If the cutaneous branch of abſorbents gains a habit of being excited into ſtronger action, and imbibes greater quantities of moiſture from the atmoſphere, at the ſame time that the urinary branch has its motions inverted, another kind of diabætes is formed, which may be termed the *aqueous diabætes*. In this diabætes, the cutaneous abſorbents frequently imbibe an amazing quantity of atmoſpheric moiſture; inſomuch, that there are authentic hiſtories, where many gallons a day, for many weeks together, above the quantity that has been drank, have been diſcharged by urine.

Dr. *Keil*, in his Medicina Statica, found that he gained eighteen ounces from the moiſt air of one night; and Dr. *Percival* affirms, that one of his hands imbibed, after being well chafed, near an ounce and half of water, in a quarter of an hour. (Tranſact. of the College *London*, vol. ii, p. 102). *Home*'s Medic. Facts, p. 2, ſect. 3.

The pale urine, in hyſterical women, or which is produced by fear or anxiety, is a temporary complaint of this kind; and would in reality be the ſame diſeaſe, if it was confirmed by habit.

6. The purging ſtools, occaſioned by expoſing the naked body to cold air, or ſprinkling it with cold water, originate from a ſimilar cauſe; for the mouths of the cutaneous lymphatics, being ſuddenly expoſed to cold, become torpid; and ceaſe, or nearly ceaſe, to act: whilſt, by the ſympathy above deſcribed, the inteſtinal lymphatics invert their motions, and immediately, what was previouſly abſorbed, is returned into the inteſtines. At the very inſtant, that the body is expoſed naked to the cold air, an unuſual movement is felt in the bowels; as is experienced by boys going into the cold bath: this could not occur from an obſtruction of the perſpirable matter, ſince there is not time for that to be returned to the bowels by the courſe of the circulation.

There is alſo a chronic *aqueous diarrhœa,* in which the atmoſpheric moiſture, drank up by the cutaneous and pulmonary lymphatics, is poured into the inteſtines, by the retrograde motions of the lacteals. This diſeaſe is moſt ſimilar to the aqeous diabætes, and is frequently exchanged for it: a diſtinct inſtance of this is recorded by *Benningerus*, cent. v. obſ. 98, in which an aqueous diarrhæa ſucceeded an aqueous diabætes. and deſtroyed the patient. There is a curious example of this, deſcribed by *Sympſon* (de re medica)--" A young man (ſays he) was ſeized with a fever, upon which a diarrhæa came on, with great ſtupor; and he refuſed to drink any thing, though he was parched up with exceſſive heat: the better to ſupply him with moiſture, I directed his feet to immerſed in cold water; immediately I obſerved a wonderful decreaſe of water in the veſſel, and then an impetuous ſtream of a fluid, ſcarcely coloured, was diſcharged by ſtool, like a cataract."

7. There is another kind of diarrhæa, which has been called cæliaca; in this diſeaſe the chyle, drank up by the lacteals of the ſmall inteſtines, is poured into the large inteſtines, by the retrograde motions of their lacteals: as in the chyliferous diabætes, the chyle is poured into the bladder, by the re-

trograde motions of the urinary branch of abſorbents.

THE chyliferous diabætes, like this chyliferous diarrhæa, produces ſudden atrophy; ſince the nouriſhment, which ought to ſupply the hourly waſte of the body, is expelled by the bladder, or rectum: whilſt the aqueous diabætes, and the aqueous diarrhaea produce exceſſive thirſt; becauſe the moiſture, which is obtained from the atmoſphere, is not conveyed to the thoracic receptacle, as it ought to be, but to the bladder, or lower inteſtines; whence the chyle, blood, and whole ſyſtem of glands, are robbed of their proportion of humidity.

8. THERE is a third ſpecies of diabaetes, in which the urine is mucaginous, and appears ropy in pouring it from one veſſel into another; and will ſometimes coagulate over the fire. This diſeaſe appears by intervals, and ceaſes again, and ſeems to be occaſioned by a previous dropſy in ſome part of the body. When ſuch a collection is re-abſorbed, it is not always returned into the circulation; but the ſame irritation, that ſtimulates one lymphatic branch to re-abſorb the

depoſited fluid, inverts the urinary branch, and pours it into the bladder. Hence this *mucaginous diabætes* is a cure, or the conſequence of a cure, of a worſe diſeaſe, rather than a diſeaſe itſelf.

Dr. *Cotunnius* gave half an ounce of cream of tartar, every morning, to a patient, who had the anaſarca; and he voided a great quantity of urine; a part of which, put over the fire, coagulated, on the evaporation of half of it, ſo as to look like the white of an egg. De iſchiade nervos.

This kind of diabaetes frequently precedes a dropſy; and has this remarkable circumſtance attending it, that it generally happens in the night; as during the recumbent ſtate of the body, the fluid, that was accumulated in the cellular membrane, or in the lungs, is more readily abſorbed, as it is leſs impeded by its gravity. I have ſeen more than one inſtance of this diſeaſe. Mr. D. a man in the decline of life, who had long accuſtomed himſelf to ſpirituous liquor, had ſwelled legs, and other ſymptoms of approaching anaſarca; about once in a week, or ten days, for ſeveral months, he was ſeized, on going to bed, with great general uneaſineſs, which his attendants reſembled to an hyſteric fit; and which terminated in a great diſcharge of viſcid urine; his legs became leſs ſwelled, and he continued in better health for ſome days afterwards. I had not the opportunity to try if this urine would coagulate over the fire, when part of it was evaporated, which I imagine would be the criterion of this kind of diabætes; as the mucaginous fluid depoſited in the cells and cyſts of the body, which have no communication with the external air, ſeems to acquire, by ſtagnation, this property of coagulation by heat, which the ſecreted mucus of the inteſtines and bladder do not appear to poſſeſs; as I have found by experiment: and if any one ſhould ſuppoſe this coagulable urine was ſeparated from the blood by the kidneys, he may recollect, that in the moſt inflammatory diſeaſes, in which the blood is moſt replete, or moſt ready to part with the coagulable lymph, none of this appears in the urine.

9. DIFFERENT kinds of diabaetes, require different methods of cure. For the firſt kind, or *chyliferous diabætes*, after clearing the ſtomach and inteſtines, by ipecacuhana and rhubarb, to evacuate any acid material,

which may too powerfully ſtimulate the mouths of the lacteals, repeated and large doſes of tincture of cantharides have been much recommended. The ſpecific ſtimulus of this medicine, on the neck of the bladder, is likely to excite the numerous abſorbent veſſels, which are ſpread on that part, into ſtronger natural actions, and by that means prevent their retrograde ones; till, by perſiſting in the uſe of the medicine, their natural habits of motions might again be eſtabliſhed. Another indication of cure, requires ſuch medicines, as by lining the inteſtines with mucilaginous ſubſtances, or with ſuch as conſiſt of ſmooth particles, or which chemically deſtroy the acrimony of their contents, may prevent the too great action of the inteſtinal abſorbents. For this purpoſe, I have found the earth precipitated from a ſolution of alum, by means of fixed alcali, given in the doſe of half a dram every ſix hours, of great advantage, with a few grains of rhubarb, ſo as to procure a daily evacuation.

The food ſhould conſiſt of materials that have the leaſt ſtimulus, with emulſions, and calcarious water, as of Briſtol and Matlock; that the mouths of the lacteals may be as little ſtimulated as is neceſſary for their proper abſorption; leaſt with their greater exertions, ſhould be connected by ſympathy, the inverted motions of the urinary lymphatics.

The ſame method may be employed with equal advantage in the aqueous diabætes, ſo great is the ſympathy between the ſkin and the ſtomach, as Dr. *Cullen* has ſo well illuſtrated, Inſtitut. of Medicine, No. 203.— To which, however, ſome application to the ſkin might be uſefully added; as rubbing the patient all over with oil, to prevent the too great action of the cutaneous abſorbents. I knew an experiment of this kind made upon one patient with apparent advantage.

The mucaginous diabætes will require the ſame treatment, which is moſt efficacious in the dropſy, and will be deſcribed below. I muſt add, that the diet and medicines above-mentioned, are ſtrongly recommended by various authors, as by *Morgan*, *Willis*, *Harris*, and *Etmuller*; but more hiſtories of the ſucceſsful treatment of theſe diſeaſes are wanting to fully aſcertain the moſt efficacious methods of cure *.

* In a letter from Mr. Charles Darwin, dated *April* 24, 1778, *Edinburgh*, is the ſubſequent paſſage:—"A man who had long laboured under a diabætes died yeſterday, in the clinical ward. He had for ſome time drank four, and paſſed twelve pounds of fluid daily; each pound of urine contained an ounce of ſugar. He took, without conſiderable relief, gum kino, ſanguis draconis melted with alum, tincture of cantharides, iſinglaſs, gum arabic, crabs eyes, ſpirit of hartſhorn, and eat ten or fifteen oyſters thrice a day.

Dr. *Home*, having read my theſis, bled him, and found that *neither the freſh blood nor the ſerum taſted ſweet.*

His body was opened this morning—every viſcus appeared in a ſound and natural ſtate, except that the left kidney had *a very ſmall pelvis*, and that there was a *conſiderable enlargement of moſt of the meſenteric lymphatic glands*. I intend to inſert this in my theſis, as it coincides with the experiment, where ſome aſparagus was eaten at the beginning of intoxication, and its ſmell perceived in the urine, though not in the blood."

Mr. *Hughs*, to whoſe unremitted care the infirmary at *Stafford* is much indebted, in a letter dated *October* 10, 1778, acquainted the editor of theſe ſheets, "that from two quarts of urine of a diabætic patient, in that infirmary, he had obtained four ounces and a half of a hard and brittle ſaccharine maſs, like treacle, which had been ſometime boiled:—And that four ounces of blood, which he had taken from the patient's arm, with deſign to examine it, had the common appearance; except that the ſerum reſembled cheeſe-whey; and that, on the evidence of four perſons, two of whom did not know what it was they taſted, the *ſerum had a ſaltiſh taſte.*"

From both theſe caſes it appears that the ſaccharine matter, with which the urine in diabætic patients ſo much abounds, never enters the blood-veſſels; like the nitre and aſparagus, which was taken during the drunken diabætes, mentioned above, *ſect.* 3.

* * *

V. The Phænomena of Dropſies explained.

SOME inebriates have their paroxyſms of inebriety terminated by much pale urine, or profuſe ſweats, or vomiting, or ſtools; others have their paroxyſms terminated by ſtupor, or ſleep, without the above evacuations.

THE former kind of theſe inebriates have been obſerved to be more liable to diabætes, and dropſy; and the latter to gout, gravel, and leproſy; as I have been well informed by a phyſician of extenſive practice and careful obſervation. *Evoe!* attend ye bacchanalians! ſtart at this dark train of evils, and amid your immodeſt jeſts, and ideot laughter recollect,

Quem Deus vult perdere, prius dementat.

IN thoſe who are ſubject to diabætes and dropſy, the abſorbent veſſels are naturally more irritable than in the latter; and by being frequently diſturbed or inverted by violent ſtimulus, and by their too great ſympathy with each other, they become at length either entirely paralytic, or are only ſuſceptible of motion from the ſtimulus of very acrid materials; as every part of the body, after having been uſed to great irritations, becomes leſs affected by ſmaller ones. Thus we cannot diſtinguiſh objects in the night, for ſome time after we come out of a ſtrong light, though the iris is preſently dilated; and the air of a ſummer evening appears cold, after we have been expoſed to the heat of the day.

THERE are no cells in the body, where dropſy may not be produced, if the lymphatics ceaſe to abſorb that mucaginous fluid, which is perpetually depoſited in them, for the purpoſe of lubricating their ſurfaces.

IF the lymphatic branch, which opens into the cellular membrane, either does its office imperfectly, or not at all; theſe cells become replete with a mucaginous fluid, which, after it has ſtagnated ſome time in the cells, will coagulate over the fire; and is erroneouſly called water. Wherever the ſeat of this diſeaſe is (unleſs in the lungs or other pendent viſcera) the mucaginous liquid above-mentioned, will ſubſide to the moſt depending parts of the body, as the feet and legs, when thoſe are lower than the head and trunk; for all theſe cells have communications with each other.

When the cellular abſorbents are become inſenſible to their uſual irritations, it moſt frequently happens, but not always, that the cutaneous branch of abſorbents, which is ſtrictly aſſociated with them, ſuffers the like inability. And then, as no water is abſorbed from the atmoſphere, the urine is not only leſs diluted at the time of its ſecretion, and conſequently in leſs quantity, and higher coloured: but great thirſt is at the ſame time induced, for as no water is abſorbed from the atmoſphere to dilute the chyle and blood, the lacteals and other abſorbent veſſels, which have not loſt their powers, are excited into more conſtant or more violent action, to ſupply this deficiency; whence the urine becomes ſtill leſs in quantity, and of a deeper colour, and turbid like the yolk of an egg, owing to a greater abſorption of its thinner parts. From this ſtronger action of thoſe abſorbents, which ſtill retain their irritability, the fat is alſo abſorbed, and the whole body becomes emaciated. This increaſed exertion of ſome branches of the lymphaties, while others are totally or partially paralytic, is reſembled by what conſtantly occurs in the hæmiplagia; when the patient has loſt the uſe of the limbs on one ſide, he is inceſſantly moving thoſe of the other; for the moving power, not having acceſs to the paralytic limbs, becomes redundant in thoſe which are not diſeaſed.

The paucity of urine and thirſt cannot be explained from a greater quantity of mucaginous fluid being depoſited in the cellular membrane: for though theſe ſymptoms have continued many weeks, or even months, this collection frequently does not amount to more than very few pints. Hence alſo the difficulty of promoting copious ſweats in anaſarca is accounted for, as well as the great thirſt, paucity of urine, and loſs of fat; ſince, when the cutaneous branch of abſorbents is paralytic, or nearly ſo, there is already too ſmall a quantity of aqueous fluid in the blood: nor can theſe torpid cutaneous lymphatics be readily excited into retrograde motions.

HENCE likewiſe we underſtand, why in the aſcites, and ſome other dropſies, there is often no thirſt, and no paucity of urine; in theſe caſes the cutaneous abſorbents continue to do their office.

SOME have believed, that dropſies were occaſioned by the inability of the kidneys, from having only obſerved the paucity of urine; and have thence laboured much to obtain diuretic medicines; but it is daily obſervable, that thoſe who die of a total inability to make water, do not become dropſical in conſequence of it: *Fernelius* mentions one, who laboured under a perfect ſuppreſſion of urine, during twenty days before his death, and yet had not ſymptoms of dropſy. Pathol. l. vi, c. 8. From the ſame idea many phyſicians have reſtrained their patients from drinking, though their thirſt has been very urgent; and ſome caſes have been publiſhed, where this cruel regimen has been thought advantageous: but others of nicer obſervation are of opinion, that it has always aggravated the diſtreſſes of the patient; and though it has abated his ſwellings, yet by inducing a fever it has haſtened his diſſolution. See tranſactions of the College, *London*, vol. ii, page 235, caſes of dropſy by Dr. *G. Baker*.

THE cure of anaſarca, ſo far as reſpects the evacuation of the accumulated fluid, coincides with the idea of the retrograde action of the lymphatic ſyſtem. It is well known, that vomits, and other drugs, which induce ſickneſs or nauſea, at the ſame time that they evacuate the ſtomach, produce a great abſorption of the lymph accumulated in the cellular membrane. In the operation of a vomit, not only the motions of the ſtomach and duodenum become inverted, but alſo thoſe of the lymphatics and lacteals, which belong to them; whence a great quantity of chyle and lymph is perpetually poured into the ſtomach and inteſtines, during the operation, and evacuated by the mouth. Now at the ſame time, other branches of the lymphatic ſyſtem, viz. thoſe which open on the cellular membrane, are brought into more energetic action, by the ſympathy above-mentioned, and an increaſe of their abſorption is produced.

HENCE repeated vomits, and cupreous ſalts, and ſmall doſes of ſquill, or foxglove, are ſo efficacious in this diſeaſe. And as draſtic purges act alſo by inverting the motions of the lacteals; and thence the other branches of lymphatics are induced into more powerful natural action, by ſympathy, and drink up the fluids from all the cells of the body; and by their anaſtomoſes, pour them into the lacteal branches; which, by their inverted actions, return them into the inteſtines; and they are thus evacuated from the body:—theſe purges alſo are uſed with ſucceſs in diſcharging the accumulated fluid in anaſarca.

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VI. Of

VI. *Of cold Sweats.*

THERE have been hiſtories given of chronical immoderate ſweatings, which bear ſome analogy to the diabætes. Dr. *Willis* mentions a lady then living, whoſe ſweats were for many years ſo profuſe, that all her bed-clothes were not only moiſtened, but deluged with them every night: and, that many ounces, and ſometimes pints, of this ſweat, were received in veſſels properly placed, as it trickled down her body. He adds, that ſhe had great thirſt, had taken many medicines, and ſubmited to various rules of life, and changes of climate, but ſtill continued to have theſe immoderate ſweats. Pharmac. ration. de ſudore anglico.

Dr. *Willis* has alſo obſerved, that the ſudor anglicanus which appeared in *England*, in 1483, and continued 'till 1551, was in ſome reſpects ſimilar to the diabætes; and as Dr. *Caius*, who ſaw this diſeaſe, mentioned the viſcidity, as well as the quantity of theſe ſweats, and adds, that the extremities were often cold, when the internal parts were burnt up with heat and thirſt, with great and ſpeedy emaciation and debility: there is great reaſon to believe, that the fluids were abſorbed from the cells of the body by the cellular and cyſtic branches of the lymphatics, and poured on the ſkin by the retrograde motions of the cutaneous ones.

The infallible *Sydenham* has recorded, in the ſtationary fever of the year 1685, the viſcid ſweats flowing from the head, which were probably from the ſame ſource as thoſe in the ſweating plague above-mentioned.

It is very common in dropſies of the cheſt or lungs, to have the difficulty of breathing relieved by copious ſweats, flowing from the head and neck. Mr. P. about 50 years of age, had for many weeks been afflicted with anaſarca of his legs and thighs, attended with difficulty of breathing: and had repeatedly been relieved by ſquill, other bitters, and chalybeates—One night the difficulty of breathing became ſo great, that it was thought he muſt have expired; but ſo copious a ſweat came out of his head and neck, that in a few hours ſome pints, by eſtimation, were wiped off from thoſe parts, and his breath was for a time relieved. This dyſpnœa and theſe ſweats recurred at intervals,

vals, and after ſome weeks he ceaſed to exiſt. The ſkin of his head and neck felt cold to the hand, and appeared pale at the time theſe ſweats flowed ſo abundantly; which is a proof, that they were produced by an inverted motion of the abſorbents of thoſe parts: for ſweats, which are the conſequence of an increaſed action of the ſanguiferous ſyſtem, are always attended with a warmth of the ſkin, greater than is natural, and a more florid colour; as the ſweats from exerciſe, or thoſe that ſucceed the cold fits of agues. Can any one explain how theſe partial ſweats ſhould relieve the difficulty of breathing in anaſarca, but by ſuppoſing that the pulmonary branch of abſorbents drank up the fluid in the cavity of the thorax, or in the cells of the lungs, and threw it on the ſkin, by the retrograde motions of the cutaneous branch? for, if we could ſuppoſe that the increaſed action of the cutaneous glands or capillaries, poured upon the ſkin, this fluid, previouſly abſorbed from the lungs; why is not the whole ſurface of the body covered with ſweat? why is not the ſkin warm? Add to this, that the ſweats above-mentioned were clammy or glutinous, which the condenſed perſpirable matter is not; whence it would ſeem to have been a different fluid from that of common perſpiration.

Dr. *Dobſon*, of *Liverpool*, has given a very ingenious explanation of the acid ſweats, which he obſerved in a diabætic patient—he thinks part of the chyle is ſecreted by the ſkin, and afterwards undergoes an acetous fermentation:—Can the chyle get thither, but by an inverted motion of the cutaneous lymphatics? in the ſame manner as it is carried to the bladder, by the inverted motions of the urinary lymphatics. Medic obſervat. and enq. *London*, vol. v.

Are not the cold ſweats in ſome fainting fits, and in dying people, owing to an inverted motion of the cutaneous lymphatics? for in theſe there can be no increaſed arterial or glandular action.

Is the difficulty of breathing, ariſing from anaſarca of the lungs, relieved by ſweats from the head and neck, whilſt that difficulty of breathing, which ariſes from a dropſy of the thorax, or pericardium, is never attended with theſe ſweats of the head? and thence can theſe diſeaſes be diſtinguiſhed from each other? do the periodic returns of nocturnal aſthma ariſe from a temporary dropſy of the lungs, collected during their more torpid ſtate in ſound ſleep, and then re-abſorbed by the vehement efforts of the diſordered organs of reſpiration, and carried off by the copious ſweats about the head and neck?

More extenſive and accurate diſſections of the lymphatic ſyſtem are wanting to enable us to unravel theſe knots of ſcience.

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VII. *Tranſlations of Matter, of Chyle, of Milk, of Urine. Operation of purging Drugs applied externally.*

1. THE tranſlations of matter from one part of the body to another, can only receive an explanation from the doctrine of the occaſional retrograde motions of ſome branches of the lymphatic ſyſtem: for how can matter, abſorbed and mixed with the whole maſs of blood, be ſo haſtily collected again in any one part? and is it not an immutable law, in animal bodies, that each gland can ſecrete no other, but its own proper fluid? which is, in part, fabricated in the very gland from an animal proceſs, which it there undergoes: of theſe purulent tranſlations innumerable and very remarkable inſtances are recorded.

2. THE chyle, which is ſeen among the materials thrown up by violent vomiting, or in purging ſtools, can only come thither by its having been poured into the bowels by the inverted motions of the lacteals: for our

aliment is not converted into chyle in the ſtomach or inteſtines by a chemical proceſs, but is made in the very mouths of the lacteals; or in the meſenteric glands; in the ſame manner as other ſecreted fluids are made by an animal proceſs in their adapted glands.

HERE a curious phœnomenon in the exhibition of mercury is worth explaining: —If a moderate doſe of calomel, as ſix or ten grains, be ſwallowed, and within one or two days a cathartic is given, a ſalivation is prevented: but after three or four days, a ſalivation having come on, repeated purges every day, for a week or two, are required to eliminate the mercury from the conſtitution. For this acrid metallic preparation, being abſorbed by the mouths of the lacteals, continues, for a time, arreſted by the meſenteric glands, (as the variolus or venereal poiſons ſwell the ſubaxillar or inguinal glands): which, during the operation of a cathartic, is returned into the inteſtines by the inverted action of the lacteals, and thus carried out of the ſyſtem.

Hence we underſtand the uſe of vomits or purges, to thoſe who have ſwallowed either contagious or poiſonous materials, even though exhibited a day or even two days after ſuch accidents; namely, that by the retrograde motions of the lacteals and lymphatics, the material ſtill arreſted in the meſenteric, or other glands, may be eliminated from the body.

3. Many inſtances of milk and chyle found in ulcers, are given by *Haller*, El. Phyſiol. t. vii, p. 12, 23, which admit of no other explanation than by ſuppoſing, that the chyle, imbibed by one branch of the abſorbent ſyſtem, was carried to the ulcer, by the inverted motions of another branch of the ſame ſyſtem.

4. Mrs. P. on the ſecond day after delivery, was ſeized with a violent purging, in which, though opiates, mucilages, the bark, and teſtacea were profuſely uſed, cantinued many days, till at length ſhe recovered. During the time of this purging, no milk could be drawn from her breaſts; but the ſtools appeared like the curd of milk broken into ſmall pieces. In this caſe, was not the

milk taken up from the follicles of the pectoral glands, and thrown on the inteſtines, by a retrogreſſion of the inteſtinal abſorbents? for how can we for a moment ſuſpect that the mucus glands of the inteſtines could ſeparate pure milk from the blood? Doctor *Smelly* has obſerved, that looſe ſtools, mixed with milk, which is curdled in the inteſtines, frequently relieves the turgeſcency of the breaſts of thoſe, who ſtudiouſly repel their milk. Caſes in Midwify, 43, No. 2. 1.

5. *J. F. Meckel* obſerved in a patient, whoſe urine was in ſmall quantity and high coloured, that a copious ſweat under the arm-pits, of a perfectly urinous ſmell, ſtained the the linen; which ceaſed again when the uſual quantity of urine was diſcharged by the urethra. Here we muſt believe from analogy, that the urine was firſt ſecreted in the kidneys, then re-abſorbed by the increaſed action of the urinary lymphatics, and laſtly carried to the axillæ by the retrograde motions of the lymphatic branches of thoſe parts. As in the jaundice it is neceſſary, that the bile ſhould firſt be ſecreted by the liver, and re-abſorbed into the circulation, to produce the yellowneſs of the ſkin; as was formerly de-

demonſtrated by the late Dr, *Monro, (Edin.* Medical Eſſays) and if in this patient the urine had been reſorbed into the maſs of blood, as the bile in the jaundice, why was it not detected in other parts of the body, as well as in the arm-pits?

6. CATHARTIC and vermifuge medicines applied externally to the abdomen, ſeem to be taken up by the cutaneous branch of lymphatics, and poured on the inteſtines by the retrograde motions of the lacteals, without having paſſed the circulation.

FOR when the draſtic purges are taken by the mouth, they excite the lacteals of the inteſtines into retrograde motions, as appears from the chyle, which is found coagulated amongſt the fæces, as was ſhewn above, (ſect 2 and 4). And as the cutaneous lymphatics are joined with the lacteals of the inteſtines, by frequent anaſtomoſes; it would be more extraordinary, when a ſtrong purging drug, abſorbed by the ſkin, is carried to the anaſtomoſing branches of the lacteals unchanged, if it ſhould not excite them into retrograde action as efficaciouſly, as if it was taken by the mouth, and mixed with the food in the ſtomach.

VIII. Circumſtances by which the fluids, that are effuſed by the retrograde Motions of the abſorbent Veſſels, are diſtinguiſhed.

1. WE frequently obſerve an unuſual quantity of mucus, or other fluids, in ſome diſeaſes, although the action of the glands, by which thoſe fluids are ſeparated from the blood, is not unuſually increaſed; but when the power of abſorption alone is diminiſhed. Thus the catarrhal humour, from the noſtrils of ſome, who ride in froſty weather; and the tears, which run down the cheeks of thoſe, who have an obſtruction of the puncta lacrymalia; and the ichor of thoſe phagedenic ulcers, which are not attended with inflammation, are all inſtances of this circumſtance.

THESE fluids however are eaſily diſtinguiſhed from others, by their abounding in ammoniacal or muriatic ſalts; whence they inflame the circumjacent ſkin: thus in the catarrh, the upper lip becomes red and ſwelled, from the acrimony of the mucus, and patients complain of the ſaltneſs of its taſte. The eyes and cheeks are red with the corroſive tears, and the ichor of ſome herpetic eruptions erodes far and wide the contiguous parts, and is pungently ſalt to the taſte, as ſome patients have informed me.

WHILST, on the contrary, thoſe fluids, which are effuſed by the retrograde action of the lymphatics, are for the moſt part mild and innocent; as water, chyle, and the natural mucus: or they take their properties from the materials previouſly abſorbed, as in the coloured or vinous urine, or that ſcented with aſparagus, deſcribed before.

2. WHENEVER the ſecretion of any fluid is increaſed, there is at the ſame time an increaſed heat in the part; for the ſecreted fluid, as the bile, did not previouſly exiſt in the maſs of blood, but a new combination is produced in the gland. Now as ſolutions are attended with cold, ſo combinations are attended with heat; and it is probable the ſum of the heat given out by all the ſecreted fluids of animal bodies may be the cauſe of their general heat above that of the atmoſphere.

HENCE the fluids derived from increaſed ſecretions are readily diſtinguiſhed from thoſe originating from the retrograde motions of the lymphatics: thus an increaſe of heat either in the diſeaſed parts, or diffuſed over the whole body, is perceptible, when copious bilious ſtools are conſequent to an inflamed liver; or a copious mucous ſalivation from the inflammatory angina.

3. WHEN any ſecreted fluid is produced, in an unuſual quantity, and at the ſame time the power of abſorption is increaſed in equal proportion, not only the heat of the gland becomes more intenſe, but the ſecreted fluid becomes thicker and milder, its thinner and ſaline parts being re-abſorbed: and theſe are diſtinguiſhable both by their greater conſiſtence, and by their heat, from the fluids, which are effuſed by the retrograde motions of the lymphatics; as is obſervable towards the termination of gonorrhæa, catarrh, chincough, and in thoſe ulcers, which are ſaid to abound with laudable pus.

4. WHEN chyle is obſerved in ſtools, or among the materials ejected by vomit, we

may be confident it muſt have been brought thither by the retrograde motions of the lacteals; for chyle does not previouſly exiſt amid the contents of the inteſtines, but is made in the very mouths of the lacteals, as was before explained.

5. When chyle, milk, or other extraneous fluids are found in the urinary bladder, or in any other excretory receptacle of a gland; no one can for a moment believe theſe have been collected from the maſs of blood by a morbid ſecretion, as it contradicts all analogy.

> ——— *Aurea duræ*
> *Mala ferant quercus? Narciſco floreat alnus?*
> *Pinguia corticibus ſudent electra myricæ?*
>
> Virgil.

IX. *Synopſis of Diſeaſes, which originate from the retrograde Motions of the abſorbent Veſſels.*

I. RETROGRADE MOTIONS OF THE ALIMENTARY CANAL.

1. *RUMINATIO.* In the rumination of horned cattle, the retrograde Motions of the œſophagus are viſible to the eye; and there are hiſtories of ruminating men, and who have taken pleaſure in the act of this ſecond maſtication of their food. (Phil. tranſactions).

2. *Ructus.* An inverted motion of the ſtomach, excluding through its upper valve an elaſtic vapour, which is generated by the fermentation of the aliment, when the digeſtion does not ſoon enough ſubdue it.

3. *Pyroſis.* Water-qualm—a few mouthfuls of the aliment are rejected at a time, for ſome hours after meals, by the inverted motions of the ſtomach and œſophagus.

When this aliment is become very acid, it produces cardialgia.

4. *Vomitus.* A violent inverted motion of the ſtomach and œſophagus, with their abſorbent veſſels, by which their contents are evacuated.

5. *Ileus.* A violent inverted motion of the whole inteſtinal canal, from the mouth to the anus; and of the lacteals, or abſorbents which ariſe from it. In this pityable diſeaſe, through the valve of the colon, through the pylorus, the cardia, the pharinx, are ejected firſt the contents of the ſtomach and inteſtines, with the excrement and even clyſters themſelves; then the fluid from the lacteals, which is now poured into the inteſtines, by their retrograde motions, is thrown up by the mouth; and laſtly, every fluid, which is abſorbed by the other lymphatic branches, from the cellular membrane, the ſkin, the bladder, and all other cavities of the body; and which is then poured into the ſtomach or inteſtines, by the retrograde motions of the lacteals: all which ſupply that amazing quantity of fluid, which is in this diſeaſe continually ejected by vomiting.

6. *Globus hyſtericus.* An ineffectual retrograde motion of the œſophagus, nothing being rejected from the ſtomach.

7. *Vomendi conamen hyſtericum.* An ineffectual retrograde motion of the ſtomach: it frequently occurs when the ſtomach is empty, and often continues many hours; and as the lymphatics of the ſtomach are not inverted at the ſame time, there is no ſupply of materials to be ejected.

8. *Borborigmus.* A partial inverſion of the periſtaltic motion of the bowels, by which the gas is brought into a ſuperior part of the bowel, and bubbles through the deſcending fluid.

9. *Hyſteria.* The three laſt articles, together with the aqueous diabætes, are the moſt common ſymptoms of the hyſteric diſeaſe: to which ſometimes is added the the ſalivatio lymphatica, and ſyncope, or convulſion, with palpitation of the heart, and great fear of dying: which laſt circumſtance diſtinguiſhes theſe convulſions from the epileptic ones, with greater certainty than any other ſingle ſymptom.

The pale copious urine, cold ſkin, palpitation of heart, and trembling, are the ſymptoms uſually excited by great fear:—hence, in hyſteric diſeaſes, when theſe ſymptoms occur, the fear, which has been formerly aſſociated with them, recurs at the ſame time.

10. *Hydrophobia.* A violent inverſion of the motions of the œſophagus on the approach of water, or other fluids. The pharynx, in this diſeaſe, ſeems to have acquired the ſenſibility of the larynx, and is equally impatient to reject any fluid, which gets into it—Is the cardia ventriculi the ſeat of this diſeaſe?

II. RETROGRADE MOTIONS OF THE ABSORBENT SYSTEM.

1. *CATARRHUS lymphaticus.* A periodical defluxion of a thin fluid from the noſtrils, for a few hours, occaſioned by the retrograde motions of their lymphatics. It is diſtinguiſhed from that mucous diſcharge which happens in froſty weather from decreaſed abſorption, becauſe it is leſs ſalt to the taſte; and from an increaſed ſecretion of mucous, becauſe it is neither ſo viſcid, nor is attended with heat of the part.

2. *Salivatio lymphatica.* A copious expuition of a pellucid inſipid fluid, occaſioned by the retrograde motions of the lymphatics of the mouth. It is ſometimes periodical, and often attends the hyſteric diſeaſe, and nervous fevers, but is not accompanied with heat of the mouth or nauſea.

3. *Nauſea.* A diſcharge of fluid from the retrograde motions of the lymphatics about the fauces, together with ſome retrograde motions of the fauces and pharinx.

4. *Diarrhœa lymphatica.* A quantity of mucus and lymph are poured into the inteſtines by the inverted motions of the inteſtinal lymphatics. The feces are leſs fetid and more liquid; and it ſometimes portends the commencement or the termination of a diabætes.

5. *Diarrhœa chylifera,* ſeu cæliaca. The chyle, drank up by the lacteals of the ſmaller inteſtines, is poured into the larger ones, by the retrograde motions of their lacteals. It differs from the lymphatic diarrhæa, as the chyliferous diabætes differs from the aqueous and mucaginous diabætes.

6. *Diabætes.* By the retrograde motions of the urinary lymphatics, an immenſe quantity of fluid is poured into the bladder. It is either termed chyliferous, or aqueous, or mucaginous, from the nature of the fluid brought into the bladder; and is either a temporary diſeaſe, as in hyſteric women, in the beginning of intoxication, in worm caſes, or in thoſe expoſed to cold damp air, or to great fear or anxiety, or in the commencement of ſome dropſies; or it becomes chronical.

When the urinary lymphatics invert their motions, and pour their refluent contents into the bladder, ſome other branch of the abſorbent ſyſtem acts with greater energy to ſupply this fluid. If it is the inteſtinal btanch, the chyliferous diabætes is produced: if it is the cutaneous branch, the aqueous diabætes is produced: and if the cellular, or cyſtic branches, the mucaginous diabætes.

7. *Sudor lymphaticus.* Profuſe ſweats, from the inverted motions of the cutaneous lymphatics, as at the approach of death; and as perhaps in the ſudor anglicanus. Theſe ſweats are glutinous to the touch, and without increaſed heat of the ſkin: if the part is uncovered the ſkin becomes cold from the evaporation of the fluid.

8. *Sudor aſthmaticus.* The cold ſweats in this diſeaſe only cover the head, arms, and breaſt, and are frequently exceedingly profuſe. Theſe ſweats are owing to the inverted motions of the cutaneous lymphatics, of the upper part of the body, and at the ſame time the increaſed abſorption of the pulmonary abſorbents: hence, theſe

ſweats, when violent, relieve the preſent fit of aſthma. In the convulſive aſthma theſe ſweats do not occur : hence they may be diſtinguiſhed. May one be called the anaſarcous aſthma, and the other the epileptic aſthma ?

* * *

III. RETROGRADE MOTIONS OF THE ARTERIAL SYSTEM.

1. *Capillarium motus retrogradus.* In microſcopic experiments it is uſual to ſee globules of blood regurgitate from the capillary veſſels again and again, before they paſs through them.

2. *Palpitatio cordis?* Ineffectual and weak retrograde motions of the heart? in hyſteric caſes? and from fear?

◆

IV. RETROGRADE MOTIONS OF VEGETABLE JUICES.

THE motions of the ſap in vegetables bear ſome analogy to our preſent ſubject; and as the vegetable tribes are by many philoſophers held to be inferior animals, it may be a matter of curioſity at leaſt to obſerve, that their abſorbent veſſels ſeem evidently, at times, to be capable of a retrograde motion. Mr. *Perault* cut off a forked branch of a tree, with the leaves on; and inverting one of the forks into a veſſel of water, obſerved, that the leaves on the other branch continued green much longer than thoſe of a ſimilar branch, cut off from the ſame tree; which ſhews, that the water from the veſſel was carried up one part of the forked branch, by the retrograde motion of its veſſels, and ſupplied nutriment ſometime to the other part of the branch, which was out of the water. And the celebrated Dr. *Hales* found, by numerous very accurate experiments, that the ſap of trees roſe upwards during the warmer hours of the day, and in part deſcended again during the cooler ones. Vegetable Statics.

It is well known that the branches of willows, and of many other trees, will either take root in the earth, or engraft on other trees, ſo as to have their natural direction inverted, and yet flouriſh with vigour.

Dr. *Hope* has alſo made this pleaſing experiment, after the manner of *Hales*—he has placed a forked branch, cut from one tree, erect between two others; then cutting off a part of the bark from one fork apply'd it to a ſimilar branch of one of the trees in its vicinity; and the ſame of the other fork; ſo that a tree is ſeen to grow ſuſpended in the air, between two other trees; which ſupply their foſter friend with due nouriſhment.

Miranturque novas frondes, et non ſua poma.

All theſe experiments clearly evince, that the juices of vegetables can occaſionally paſs either upwards or downwards in their abſorbent ſyſtem of veſſels.

X. *Objections anſwered.*

THE following experiment, at firſt view, would ſeem to invalidate this opinion of the retrograde motions of the lymphatic veſſels, in ſome diſeaſes.

ABOUT a gallon of milk having been given to an hungry ſwine, he was ſuffered to live about an hour, and was then killed by a ſtroke or two on his head, with an axe.—On opening his belly the lacteals were well ſeen filled with chyle; on irritating many of the branches of them with a knife, they did not appear to empty themſelves haſtily; but they did, however, carry forwards their contents in a little time.

I THEN paſſed a ligature round ſeveral branches of lacteals, and irritated them much with a knife beneath the ligature, but could not make them regurgitate their contained fluid into the bowels.

I AM not indeed certain, that the nerve was not at the ſame time included in the ligature,

gature, and thus the lymphatic rendered unirritable or lifeleſs; but this, however, is certain, that it is not any quantity of any ſtimulus, which induces the veſſels of animal bodies to revert their motions; but a certain quantity of a certain ſtimulus, as appears from wounds in the ſtomach, which do not produce vomiting; and wounds of the inteſtines, which do not produce the cholera morbus.

AT *Nottingham*, a few years ago, two ſhoemakers quarrelled, and one of them with a knife, which they uſe in their occupation, ſtabbed his companion about the region of the ſtomach. On opening the abdomen of the wounded man, after his death, the food and medicines he had taken were, in part, found in the cavity of the belly, on the outſide of the bowels; and there was a wound about half an inch long, at the bottom of the ſtomach; which I ſuppoſe was diſtended with liquor and food, at the time of the accident; and thence was more liable to be injured at its bottom: but during the whole time he lived, which was about ten days, he had no efforts to vomit, nor ever even complained of being ſick at his ſtomach! Other caſes ſimilar to this are mentioned in the philoſophical tranſactions.

Thus, if you vellicate the throat with a feather, nauſea is produced; if you wound it with a penknife, pain is induced, but not ſickneſs. So if the ſoles of the feet of children, or their armpits are tickled, convulſive laughter is excited, which ceaſes the moment the hand is applied, ſo as to rub them more forcibly.

The experiment, therefore, above-related, upon the lacteals of a dead pig, which were included in a ſtrict ligature, proves nothing; as it is not the quantity, but the kind of ſtimulus, which excites the lymphatic veſſels into retrograde motion.

XI. The Cauſes which induce the retrograde Motions of animal Veſſels; and the Medicines by which the natural Motions are reſtored.

1. SUCH is the conſtruction of animal bodies, that all their parts, which are ſubjected to leſs ſtimuli than nature deſigned, perform their functions with leſs accuracy: thus, when too watery, or too aceſcent food, is taken into the ſtomach, indigeſtion, and flatulency, and heartburn ſucceed.

2. ANOTHER law of irritation, connate with our exiſtence, is, that all thoſe parts of the body, which have previouſly been expoſed to too great a quantity of ſuch ſtimuli, as ſtrongly affect them, become for ſome time afterwards diſobedient to the natural quantity of their adapted ſtimuli.—Thus the eye is incapable of ſeeing objects in an obſcure room, though the iris is quite dilated, after having been expoſed to the meridian ſun.

3. There is a third law of irritation, that all the parts of our bodies, which have been lately ſubjected to leſs ſtimulus, than they have been accuſtomed to, when they are expoſed to their uſual quantity of ſtimulus, are excited into more energetic motions: thus when we come from a duſky cavern into the glare of daylight, our eyes are dazzled; and after emerging from the cold bath, the ſkin becomes warm and red.

4. There is a fourth law of irritation, that all the parts of our bodies, which are ſubjected to ſtill ſtronger ſtimuli for a length of time, become torpid, and refuſe to obey even theſe ſtronger ſtimuli; and thence do their offices very imperfectly—Thus, if any one looks earneſtly for ſome minutes on an area, an inch diameter, of red ſilk, placed on a ſheet of white paper, the image of the ſilk will gradually become pale, and at length totally vaniſh, as Mr. *Buffon* obſerves; and I have myſelf frequently experienced. Mem. de l'acad. roy.

5. Nor is it the nerves of ſenſe alone, as the optic and auditory nerves, that thus become torpid, when the ſtimulus is withdrawn,

or their irritability decreaſed; but the motive muſcles, when they are deprived of their natural ſtimuli, or of their irritability, become torpid and paralytic; as is ſeen in the tremulous hand of the drunkard, in a morning; and in the awkward ſtep of age.

The hollow muſcles alſo, of which the various veſſels of the body are conſtructed, when they are deprived of their natural ſtimuli, or of their due degree of irritability, not only become tremulous, as the arterial pulſations of dying people; but alſo frequently invert their motions, as in vomiting, in hyſteric ſuffocations, and diabætes above-deſcribed.

I must beg your patient attention, for a few moments, whilſt I endeavour to explain, how the retrograde actions of our hollow muſcles are the conſequence of *their* debility; as the tremulous actions of the ſolid muſcles are the conſequence of *their* debility. When, through fatigue, a muſcle can act no longer; the antagoniſt muſcles, either by their inanimate elaſticity, or by their] animal action, draw the limb into a contrary direction: in the ſolid muſcles, as thoſe of locomotion, their actions are *aſſociated in* *tribes*, which have been accuſtomed to ſynchronous action only; hence when they are fatigued, only a ſingle contrary effort takes place; which is either tremulous, when the fatigued muſcles are again immediately brought into action; or it is a pandiculation, or ſtretching, where they are not immediately again brought into action.

Now the motions of the hollow muſcles, as they in general propel a fluid along their cavities, are *aſſociated in trains*, which have been accuſtomed to ſucceſſive actions: hence when one ring of ſuch a muſcle is fatigued from its too great debility, and is brought into retrograde action, the next ring from its aſſociation falls *ſucceſſively* into retrograde action; and ſo on throughout the whole canal.

6. But as the retrograde motions of the ſtomach, œſophagus, and fauces in vomiting are, as it were, apparent to the eye; we ſhall conſider this operation more minutely, that the ſimilar operations in the more recondite parts of our ſyſtem may be eaſier underſtood.

FROM certain nauſeous ideas of the mind, from an ungrateful taſte in the mouth, or from fœtid ſmells, vomiting is ſometimes inſtantly excited; or even from a ſtroke on the head, or from the vertiginous motions of a ſhip; all which originate from aſſociation, or ſympathy; and which, leaſt I ſhould abuſe your patience, I ſhall not now endeavour to explain.

BUT when the ſtomach is ſubjected to a leſs ſtimulus than is natural, according to the firſt law of irritation, mentioned above, its motions become diſturbed, as in hunger; firſt pain is produced, then ſickneſs, and at length vain efforts to vomit, as many authors inform us.

BUT when a great quantity of wine, or of opium, are ſwallowed, the retrograde motions of the ſtomach do not occur till after ſeveral minutes, or even hours: for when the power of ſo ſtrong a ſtimulus ceaſes, according to the ſecond law of irritation, mentioned above, the periſtaltic motions become tremulous, and at length retrograde; as is well known to the drunkard, who on the next morning has ſickneſs and vomitings.

When a ſtill greater quantity of wine, or of opium, or when nauſeous vegetables, or ſtrong bitters, or metallic ſalts, are taken into the ſtomach, they quickly induce vomiting; though all theſe, in leſs doſes, excite the ſtomach into more energetic action, and ſtrengthen the digeſtion; as the flowers of chamomile, and the vitriol of zine: for, according to the fourth law of irritation, the ſtomach will not long be obedient to a ſtimulus ſo much greater than is natural; but its action becomes firſt tremulous and then retrograde.

7. When the motions of any veſſels become retrograde, leſs heat of the body is produced; for in paroxyſms of vomiting, of hyſteric affections, of diabætes, of aſthma, the extremities of the body are cold: hence we may conclude, that theſe ſymptoms ariſe from the debility of the parts in action; for an increaſe of muſcular action is always attended with increaſe of heat.

8. But as animal debility is owing to defect of ſtimulus, or to defect of irritability, as ſhewn above, the method of cure is eaſily deduced: when the vaſcular muſcles are not excited into their due action by the natural

ſtimuli, we ſhould exhibit thoſe medicines, which poſſeſs a ſtill greater degree of ſtimulus; amongſt theſe are the fœtids, the volatiles, aromatics, bitters, metallic ſalts, opiates, wine, which indeed ſhould be given in ſmall doſes, and frequently repeated. To theſe ſhould be added conſtant, but moderate exerciſe, chearfulneſs of mind, and change of country to a warmer climate; and perhaps, occaſionally the external ſtimulus of bliſters.

It is alſo frequently uſeful to diminiſh the quantity of natural ſtimulus, for a ſhort time, by which afterwards the irritability of the ſyſtem becomes increaſed; according to the third law of irritation above-mentioned, hence the uſe of baths ſomewhat colder than animal heat, and of equitation in the open air.

THUS have I endeavoured, in a conciſe manner, to explain the numerous diſeaſes, which deduce their origin from the inverted motions of the hollow muſcles of our bodies: and it is probable the Saint Vitus's dance, and the ſtammering of ſpeech, originate from a ſimilar inverted order of the aſſociated motions of ſome of the ſolid muſcles; which, as it is foreign to my preſent purpoſe, I ſhall not here diſcuſs.

I BEG, illuſtrious profeſſors, and ingenious fellow-ſtudents, that you will recollect how difficult a taſk I have attempted, to evince the retrograde motions of the lymphatic veſſels, when the veſſels themſelves, for ſo many ages, eſcaped the eyes and glaſſes of philoſophers: and if you are not quite convinced of the truth of this theory, hold, I entreat you, your minds in ſuſpence, 'till ANATOMY draws her ſword, with happier omens, cuts aſunder the knots which entangle PHYSIOLOGY; and, like an augur, inſpecting the immolated victim, announces to mankind the wiſdom of HEAVEN.

A NOTE belonging to *Page* 65, *and* 68.

THE foxglove has been given to dropſical patients in this country with conſiderable ſucceſs: the following caſes are related with deſign to aſcertain the particular kinds of dropſy, in which this drug is preferable to ſquill, or other evacuants.

Anaſarca of the Lungs.

1. A LADY, between forty and fifty years of age, had been indiſpoſed ſometime, was then ſeized with cough, and fever, and afterwards expectorated much digeſted mucus. This expectoration ſuddenly ceaſed, and a conſiderable difficulty of breathing ſupervened, with a pulſe very irregular both in velocity and ſtrength; ſhe was much diſtreſſed at firſt lying down, and at firſt riſing; but

after a minute or two bore either of thoſe attitudes with eaſe. She had no pain or numbneſs in her arms; ſhe had no hectic fever, nor any cold ſhiverings, and *the urine was in due quantity, and of the natural colour.*

The difficulty of breathing was twice conſiderably relieved by ſmall doſes of ipecacuhana, which operated upwards and downwards, but recurred in a few days: ſhe was then directed a decoction of foxglove, (digitalis purpurea) prepared by boiling four ounces of the freſh leaves from two pints of water to one pint; to which was added two ounces of vinous ſpirit: ſhe took three large ſpoonfuls of this mixture every two hours, till ſhe had taken it four times; a continued ſickneſs ſupervened, with frequent vomiting, and a copious flow of urine: theſe evacuations continued at intervals for two or three days, and relieved the difficulty of breathing —She had ſome relapſes afterwards, which were again relieved by the repetition of the decoction of foxglove.

2. A gentleman, about ſixty years of age, who had been addicted to an immoderate uſe of fermented liquors, and had been

very corpulent, gradually loſt his ſtrength and fleſh; had great difficulty of breathing, with legs ſomewhat ſwelled, and a very irregular pulſe. He was very much diſtreſſed at firſt lying down, and at firſt riſing from his bed, yet *in a minute or two was eaſy in both thoſe attitudes. He made ſtraw-coloured urine in due quantity,* and had no pain or numbneſs of his arms.

He took a large ſpoonful of the decoction of foxglove, as above, every hour for ten or twelve ſucceſſive hours, had inceſſant ſickneſs for about two days, and paſſed a large quantity of urine; upon which his breath became quite eaſy, and the ſwelling of his legs ſubſided, but as his whole conſtitution was already ſinking from the previous intemperance of his life, he did not ſurvive more than three or four months.

Hydrops Pericardii.

3. A GENTLEMAN of temperate life and ſedulous application to buſineſs, between thirty and forty years of age, had long been ſubject, at intervals, to an irregular pulſe: a

few months ago he became weak, with difficulty of breathing, and dry cough. In this ſituation a phyſician of eminence directed him to abſtain from all animal food and fermented liquor, during which regimen all his complaints increaſed; he now became emaciated, and totally loſt his appetite; his pulſe very irregular both in velocity and ſtrength; with great difficulty of breathing and ſome ſwelling of his legs; yet *he could lie down horizontally in his bed,* though he got little ſleep, and paſſed *a due quantity of urine, and of the natural colour:* no fullneſs or hardneſs could be perceived about the region of the liver; and he had no pain or numbneſs in his arms.

One night he had a moſt profuſe *ſweat all over his body and limbs,* which quite deluged his bed, and for a day or two ſomewhat relieved his difficulty of breathing, and his pulſe became leſs irregular: this copious ſweat recurred three or four times at the intervals of five or ſix days, and repeatedly alleviated his ſymptoms.

He was directed one large ſpoonful of the above decoction of foxglove every hour, till it procured ſome conſiderable evacuation;

after he had taken it eleven ſucceſſive hours he had a few liquid ſtools, attended with a great flow of urine, which laſt had a dark tinge, as if mixed with a few drops of blood: he continued ſick at intervals for two days, but his breath became quite eaſy, and his pulſe quite regular, the ſwelling of his legs diſappeared, and his appetite and ſleep returned.

He then took three grains of white vitriol twice a day, with ſome bitter medicines, and a grain of opium with five grains of rhubarb every night; was adviſed to eat fleſh meat, and ſpice, as his ſtomach would bear it, with ſmall beer, and a few glaſſes of wine; and had iſſues made in his thighs; and has ſuffered no relapſe.

4. A lady, about fifty years of age, had for ſome weeks great difficulty of breathing, with very irregular pulſe, and conſiderable general debility: ſhe *could lie down in bed*, and the *urine was in due quantity and of the natural colour*, and ſhe had no pain or numbneſs of her arms.

She took one large ſpoonful of the above decoction of foxglove every hour, for ten or twelve ſucceſſive hours; was ſick, and made a quantity of pale urine for about two days, and was quite relieved both of the difficulty of breathing, and the irregularity of her pulſe. She then took a grain of opium, and five grains of rhubarb, every night, for many weeks; with ſome ſlight chalybeate and bitter medicines, and has ſuffered no relapſe.

Hydrops Thoracis.

5. A TRADESMAN, about fifty years of age, became weak and ſhort of breath, eſpecially on increaſe of motion, with *pain in one arm,* about the inſertion of the biceps muſcle. He obſerved he ſometimes in the night made an unuſual quantity of pale water. He took calomel, alum, and peruvian bark, and all his ſymptoms increaſed: his legs began to ſwell conſiderably; his breath became more difficult, and he *could not lie down in bed*; but all this time he made *a due quantity of ſtraw-coloured water.*

THE decoction of foxglove was given, as in the preceeding caſes, which operated chiefly by purging, and ſeemed to relieve his breath for a day or two; but alſo ſeemed to contribute to weaken him—He became after ſome weeks univerſally dropſical, and died comatous.

6. A YOUNG lady of delicate conſtitution, with light eyes and hair, and who had perhaps lived too abſtemiouſly both in reſpect to the quantity and quality of what ſhe eat and drank, was ſeized with great difficulty of breathing, ſo as to threaten immediate death. Her extremities were quite cold, and her breath felt cold to the back of ones hand. She had no ſweat, *nor could lie down for a ſingle moment*; and had previouſly and at preſent complained of great weakneſs and *pain and numbneſs of both her arms*; had no ſwelling of her legs, no thirſt, water in due quantity and colour. Her ſiſter, about a year before, was afflicted with ſimilar ſymptoms, was repeatedly blooded, and died univerſally dropſical.

A GRAIN of opium was given immediately and repeated every ſix hours with evident and amazing advantage; afterwards a bliſter, with chalybeates, bitters, and eſſential oils were exhibited, but nothing had ſuch eminent effect in relieving the difficulty of breathing and coldneſs of her extremities as opium, by the uſe of which in a few weeks ſhe perfectly regained her health, and has for more than two years ſuffered no relapſe.

Aſcites.

7. A YOUNG lady of delicate conſtitution having been expoſed to great fear, cold, and fatigue, by the overturn of a chaiſe in the night, began with pain and tumour in the right hypochondrium: in a few months a fluctuation was felt throughout the whole abdomen, more diſtinctly perceptible indeed about the region of the ſtomach; ſince the integuments of the lower part of the abdomen generally become thickened in this diſeaſe by a degree of anaſarca. Her legs were not ſwelled, no thirſt, water in due quantity and colour—She took the foxglove ſo as to induce ſickneſs and ſtools, but without abating the ſwelling, and was obliged at length to ſubmit to the operation of tapping.

8. A MAN about ſixty-ſeven, who had long been accuſtomed to ſpirituous potation, had ſome time laboured under aſcites; his legs ſomewhat ſwelled; his breath eaſy in all

attitudes; no appetite; great thirſt; urine in exceedingly ſmall quantity, very deep coloured, and turbid; pulſe equal. He took the foxglove in ſuch quantity as vomited him, and induced ſickneſs for two days; but procured no flow of urine, or dimunition of his ſwelling; but was thought to leave him conſiderably weaker.

9. A CORPULENT man, accuſtomed to large potation of fermented liquors, had vehement cough, difficult breathing, anaſarca of his legs, thighs, and hands, and conſiderable tumour, with evident fluctuation of his abdomen; his pulſe was equal, his urine in ſmall quantity, of deep colour, and turbid. Theſe ſwellings had been twice conſiderably abated by draſtic cathartics. He took three ounces of a decoction of foxglove (made by boiling one ounce of the freſh leaves in a pint of water) every three hours, for two whole days; it then began to vomit and purge him violently, and promoted a great flow of urine; he was by theſe evacuations compleatly emptied in twelve hours. After two or three months all theſe ſymptoms returned, and were again relieved by the uſe of the foxglove; and thus in the ſpace of

about three years he was about ten times evacuated, and continued all that time his uſual potations: excepting at firſt, the medicine operated only by urine, and did not appear conſiderably to weaken him—The laſt time he took it, it had no effect; and a few weeks afterwards he vomited a great quantity of blood and expired.

QUERIES.

1. As the firſt ſix of theſe patients had a due diſcharge of urine, and of the natural colour; was not the ſeat of the diſeaſe confined to ſome part of the thorax; and the ſwelling of the legs rather a ſymptom of the obſtructed circulation of the blood, than of a paralyſis of the cellular lymphatics of thoſe parts?

2. When the original diſeaſe is a general anaſarca, do not the cutaneous lymphatics always become paralytic at the ſame time with the cellular ones, by their greater ſympathy with each other? and hence the paucity of urine, and the great thirſt diſtinguiſh this kind of dropſy?

3. In the anaſarca of the lungs, when the diſeaſe is not very great, though the patients have conſiderable difficulty of breathing at their firſt lying down, yet after a minute or two their breath becomes eaſy again; and the ſame occurs at their firſt riſing. Is not this owing to the time neceſſary for the fluid in the cells of the lungs to change its place, ſo as the leaſt to incommode reſpiration in the new attitude?

4. In the dropſy of the pericardium does not the patient bear the horizontal or perpendicular attitude with equal eaſe? Does this circumſtance diſtinguiſh the dropſy of the pericardium from that of the lungs and of the thorax?

5. Do the univerſal ſweats diſtinguiſh the dropſy of the pericardium, or of the thorax? and thoſe, which cover the upper parts of the body only, the anaſarca of the lungs?

6. When in the dropſy of the thorax, the patient endeavours to lie down; does not the extravaſated fluid compreſs the upper parts of the bronchia, and totally preclude the acceſs of air to every part of the lungs; whilſt in the perpendicular attitude the inferior

ferior parts of the lungs only are compreſſed? Does not ſomething ſimilar to this occur in the anaſarca of the lungs, when the diſeaſe is very great, and thus prevent thoſe patients alſo from lying down?

7. As a principal branch of the fourth cervical nerve of the left ſide, after having joined a branch of the third and of the ſecond cervical nerves, deſcending between the ſubclavian vein and artery, is received in a groove formed for it in the pericardium, and is obliged to make a conſiderable turn outwards to go over the prominent part of it, where the point of the heart is lodged, in its courſe to the diaphragm; and as the other phrenic nerve of the right ſide has a ſtreight courſe to the diaphragm; and as many other conſiderable branches of this fourth pair of cervical nerves are ſpread on the arms; does not a pain in the left arm diſtinguiſh a diſeaſe of the pericardium, as in the angina pectoris, or in the dropſy of the pericardium? and does not a pain or weakneſs in both arms diſtinguiſh the dropſy of the thorax?

8. Do not the dropſies of the thorax and pericardium frequently exiſt together, and thus add to the uncertainty and fatallity of the diſeaſe?

9. MIGHT not the foxglove be ſerviceable in hydrocephalus internus, in hydrocele, and in white ſwellings of the joints?

◆

A NOTE belonging to Page 58, containing a further Account of the Patient affected with the Chyliferous Diabætes in the *Stafford* Infirmary.

RICHARD DAVIES, aged 33, a whiteſmith by trade, had drank hard by intervals; was much troubled with ſweating of his hands, which incommoded him in his occupation, but which ceaſed on his frequently dipping them in lime. About ſeven months ago he began to make large quantities of water; his legs are ædematous, his belly tenſe, and he complains of a riſing in his throat, like the globus hyſtericus: he eats twice as much as other people, drinks about fourteen pints of ſmall beer a day, beſides a pint of ale, ſome milk-porrage, and a baſon of broth, and he makes about eighteen pints of water a day.

HE tried alum, dragon's blood, ſteel, blue vitriol, and cantharides in large quantities, and duly repeated, under the care of Dr. *Underhill,* but without any effect; except that on the day after he omitted the cantharides, he made but twelve pints of water, but on the next day this good effect ceaſed again.

November 21—HE made eighteen pints of water, and he now at my requeſt took a grain of opium every four hours, and five grains of aloes at night; and had a flannel ſhirt given him.

22—MADE ſixteen pints. 23—thirteen pints: drinks leſs.

24—INCREASED the opium to a grain and quarter every four hours: he made twelve pints:

25—INCREASED the opium to a grain and half: he now makes ten pints; and drinks eight pints in a day.

THE opium was gradually increaſed during the next fortnight, till he took three grains every four hours, but without any farther dimunition of his water. During the uſe of the opium he ſweat much in the nights, ſo as to have large drops ſtand on his face and all over him. The quantity of opium was then gradually decreaſed, but not totally omitted, as he continued to take about a grain morning and evening.

January 17—HE makes fourteen pints of water a day. Dr. *Underhill* now directed him two ſcruples of common roſin triturated with as much ſugar, every ſix hours; and three grains of opium, every night.

19—MAKES fifteen pints of water: ſweats at night.

21—MAKES ſeventeen pints of water; has twitchings of his limbs in a morning, and pains of his legs: he now takes a dram of roſin for a doſe, and continues the opium.

23—WATER more coloured, and reduced to ſixteen pints, and he thinks has a brackiſh taſte.

26—WATER reduced to fourteen pints.

28—WATER thirteen pints: he continues the opium, and takes four ſcruples of the roſin for a doſe.

February 1—WATER twelve pints.

4—WATER eleven pints: twitchings leſs; takes five ſcruples for a doſe.

8—WATER ten pints: has had many ſtools.

12—APPETITE leſs: purges very much.

AFTER this the roſin either purged him, or would not ſtay on his ſtomach; and he gradually relapſed nearly to his former condition, and in a few months ſunk under the diſeaſe.

October 3—MR. *Hughes* evaporated two quarts of the water, and obtained four ounces and half of a ſaccharine maſs from it, like boiled treacle; on the ſame day four ounces of blood were taken from his arm, the ſerum of which had a ſaltiſh taſte.—Hence it appears, firſt, that the proceſs of digeſtion reſembles the proceſs of the germination of vegetables, or of making barley into malt; as the vaſt quantity of ſugar found in the urine muſt be made from the food, which he took (which was double that taken by others) and from the fourteen pints of ſmall beer which he drank. And, ſecondly, as the ſerum of the blood was not ſweet, the chyle appears to have been conveyed to the bladder without entering the circulation of the blood, ſince ſo large a quantity of ſugar, as was found in the urine, namely, twenty ounces a day, could not have previouſly exiſted in the blood without being perceptible to the taſte.

November 1—Mr. *Hughes* diſſolved two drams of nitre in a pint of a decoction of the roots of aſparagus, and added to it two ounces of tincture of rhubarb: the patient took a fourth part of this mixture every five minutes, till he had taken the whole—In about half an hour he made eighteen ounces of water, which was very manifeſtly tinged with the rhubarb; the ſmell of aſparagus was doubtful.

He then loſt four ounces of blood, the ſerum of which was not ſo opake as that drawn before, but of a yellowiſh caſt, as the ſerum of the blood uſually appears.

Paper, dipped three or four times in the tinged urine and dryed again, did not ſcintillate,

tillate, when it was ſet on fire; but when the flame was blown out, the fire ran along the paper for half an inch; which when the ſame paper was unimpregnated, it would not do; nor when the ſame paper was dipped in urine made before he took the nitre, and dry'd in the ſame manner.

Paper, dipped in the ſerum of the blood and dry'd, in the ſame manner as in the urine, did not run along the paper, when the flame was blown out; but burnt exactly in the ſame manner, as the ſame paper dipped in the ſerum of blood drawn from another perſon.

This experiment, which is copy'd from a letter of Mr. *Hughes*, as well as the former, ſeems to evince the exiſtence of another paſſage from the inteſtines to the bladder, in this diſeaſe, beſides that of the ſanguiferous ſyſtem; and coincides with the curious experiment related in ſection the third, except that the ſmell of the aſparagus was not here perceived, owing perhaps to the roots having been made uſe of inſtead of the heads.

The riſing in the throat of this patient, and the twitchings of his limbs ſeem to indicate ſome ſimilarity between the diabætes and the hyſteric diſeaſe, beſides the great flow of pale urine, which is common to them both.

Perhaps if the meſenteric glands were nicely inſpected in the diſſections of theſe patients; and if the thoracic duct, and the larger branches of the lacteals, and if the lymphatics, which ariſe from the bladder, were well examined by injection, or by the knife, the cauſe of diabætes might be more certainly underſtood.

The opium alone, and the opium with the roſin, ſeem much to have ſerved this patient; and might probably have effected a cure: if the diſeaſe had been ſlighter, or the medicine had been exhibited, before it had been confirmed by habit, during the ſeven months it had continued. The increaſe of the quantity of water on beginning the large doſes of roſin was probably owing to his omitting the morning doſes of opium.

NOTE belonging to Page 43.

A GENTLEMAN, who had been ſome weeks affected with jaundice, and whoſe urine was in conſequence of a very deep yellow, took ſome cold ſmall punch, in which was diſſolved about a dram of nitre; he then took repeated draughts of the punch, and kept himſelf in a cool room, 'till on the approach of ſlight intoxication he made a large quantity of water; this water had a ſlight yellow tinge, as might be expected from a ſmall admixture of bile ſecreted from the kidneys; but if the whole of it had paſſed through the ſanguiferous veſſels, which were now replete with bile, (his whole ſkin being as yellow as gold) would not this urine alſo, as well as that he had made for weeks before, have been of a deep yellow? Paper dipped in this water, and dry'd, and ignited, ſhewed evident marks of the preſence of nitre, when the flame was blown out.

I BEG leave to add the following circumſtance of this caſe, though foreign to the argument. He was near fifty years of age, had had the jaundice about ſix weeks, without pain, ſickneſs, or fever: and had taken emetics, cathartics, mercurials, bitters, chalybeates, eſſential oil, and ether, without apparent advantage. On a ſuppoſition that the obſtruction of the bile might be owing to the paralyſis, or torpid action of the common bile duct, and the ſtimulants taken into the ſtomach ſeeming to have no effect, I directed half a ſcore ſmart electric ſhocks, from a coated bottle, which held about a quart, to be paſſed through the liver, and along the courſe of the common gall-duct, as near as could be gueſſed, and on that very day the ſtools became yellow; he continued the electric ſhocks a few more days and his ſkin gradually became clear.

* * *

NOTE belonging to Page 39.

"THE valves of the thoracic duct are few, ſome aſſert they are not more than twelve, and that they do not very accurately perform their office, as they do not cloſe the whole area of the duct, and thence may permit chyle to repaſs them downwards.

"In living animals, however, *though not always*, yet more frequently than in the dead, they prevent the chyle from returning.

"The principle of theſe valves is that, which preſides over the inſertion of the thoracic duct, into the ſubclavian vein; many have believed this alſo to perform the office of a valve, both to admit the chyle into the vein, and to preclude the blood from entering the duct; but in my opinion it is ſcarcely ſufficient for this purpoſe." *Haller* El. Ph. t. 7, p. 226.

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ADVERTISEMENT.

THERE are other ingenious Works of the late Mr. DARWIN *in the Hands of the Editor, which may perhaps at ſome diſtant Time be given to the public, if the medical World ſeems to require them.*

LIFE

OF THE

AUTHOR.

MR. CHARLES DARWIN was from his infancy accuſtomed to examine all natural objects with more attention than is uſual: firſt by his ſenſes ſimply; then by tools, which were his playthings—By this early uſe of his hands, he gained accurate ideas of many of the qualities of bodies; and was thence afterwards enabled to acquire the knowledge of mechanics with eaſe and with accuracy; and the invention and improvement of machines was one of the firſt efforts of his ingenuity, and one of the firſt ſources of his amuſement.

HE had frequent opportunities in his early years of obſerving the various foſſile productions in their native beds; and deſcended the mines, and climbed the precipices of *Derbyſhire*, and of ſome other counties, with uncommon pleaſure and obſervation. He collected with care the products of theſe countries, and examined them by ſuch experiments, as he had been taught, or had diſcovered: hence he obtained not only diſtinct but indelible ideas of the properties of bodies, at the very time when he learnt the names of them; and thus the complicate ſcience of chemiſtry became not only eaſy, but delightful to him.

About the age of nine he travelled into *France* with an ingenious botaniſt, Mr. *Dickenſon* of *Blimhill* in *Shropſhire*, and thus acquired a taſte for that branch of ſcience; and had at the ſame time his ear accuſtomed to the tones of the French language, without taking off his attention from his favourite purſuit of the properties and diſtinctions of natural bodies.

Ye claſſic ſchools! ye not only overcome the ſtruggling efforts of genius, and bind his Proteus-forms, till he ſpeaks the language you require; but you then divert his attention from the nice compariſon of things with each other, and from aſſociating the ideas of cauſes and their effects; and amuſe him with the looſer analogies, the vain verbal alluſions which conſtitute the ornaments of poetry and of oratory! —— Mr. *Darwin* acquired a competent knowledge of the latin and greek languages, chiefly by reading books of uſeful knowledge, or which contained the elements of ſcience: and which were more agreeable to him than the monſtrous and immoral tales of heathen mythology, or of fabulous hiſtory. He was of opinion, that to ſtudy theſe dead languages ſo accurately as to criticiſe their beauties, and at a time when all their books of real value had been repeatedly tranſlated, was a prodigality of labour, which might ſuit the retirement of a pedant, but was unbecoming an active philoſopher: that to acquire a taſte for greek poetry by years of ill-employed induſtry, was not much more important than to acquire the power of playing well on ſome one muſical inſtrument: and that, in the ſchools of language as in the ſchools of drawing, a man of ſcience ſhould learn the uſe of the pen and pencil, as far as they are concerned in the expreſſion or communication of diſtinct or uſeful ideas; but to waſte the firſt twenty years of life in learning the metaphors of language, or the drapery of drawing, might ſerve thoſe, who made poetry or painting a profeſſion; but was liable to diſqualify the mind for the more energetic purſuits of buſineſs or philoſophy.

During the time employed in the acquiſition of theſe languages, beſides his occaſional advancement in botany, foſſile hiſtory, and chemiſtry, he had the opportunity of learning the outlines of anatomy; and of applying himſelf to natural philoſophy experimentally; as well as to the elements of algebra and geometry; and, whenever it was in his power, he ſedulouſly ſought the ſociety of ingenious men, who were judges of his acquirements and ſagacity, and whoſe attention flattered him, at the ſame time that their converſation improved him.

Nor amid theſe acquirements of knowledge was his taſte for morality neglected; for his ingenious mother, even to her lateſt hour! inſtilled into his breaſt a ſympathy with the pains and with the pleaſures of others, by ſympathizing herſelf with their diſtreſs or exultation: ſhe flattered him into a ſenſe of honour by commending his integrity, and ſcorn of falſhood, before her friends: and taught him prudence by pointing out to him the ill conſequences of the bad conduct of others, whoſe names or perſons he was acquainted with: and as ſhe had wiſely ſown no ſeeds of ſuperſtition in his mind, there was nothing to overſhade the virtues, ſhe had implanted.

About the commencement of his ſixteenth year he was induced by the advice of his friends to admit himſelf of *Chriſt-church* College in *Oxford*, and paſſed a year rather againſt his inclination in that Univerſity; where he thought the vigour of the mind languiſhed in the purſuit of claſſical elegance, like Hercules at the diſtaff, and ſigh'd to be removed to the robuſter exerciſes of the medical ſchools of *Edinburgh*.

Here his genius breathed its natural element, ſprung aloft, and ſoared on ſtrong and glittering wing,—till the arrow of contagion reached his flight, and plunged him into the grave!——

Too oft, when virtue launches her adventurous ſkiff to ſave her wreck'd companions, ſhe periſhes in the wave herſelf!—Such is the government of this world!——

At this Univerſity he not only heard the numerous medical lectures with unwearied attention, duly viſited the general hoſpital, aſſiſted his much-valued friend Dr. *Duncan*, in his public diſpenſary *, was buſied in the diſputations, and treatiſes of the medical ſocieties; but undertook the care, and attended with diligence all the ſick poor of the pariſh of *Waterleith*, and ſupplied them with the neceſſary medicines.

Here it was, about the end of *April*, that he had employed the greateſt part of the day in accurately diſſecting the brain of a child, who had died of the hydrocephalus internus—That very evening he was ſeized with ſevere headach, to which on the next morning febrile ſymptoms ſupervened, with delirium, petechiæ, hæmmorrhage, paralyſis of the bladder, and other circumſtances of extreme debility which terminated in death.

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* Medical Caſes, by Dr. *A. Duncan*, Preface and Page 353.

The following character is extracted from the medical and philoſophical commentaries, publiſhed periodically at *Edinburgh*, vol. 5, p. 332, and v. 6, p. 227.

" THUS was the medical world deprived of a young man, from the continued exertions of whoſe induſtry and genius there was reaſon to entertain the moſt ſanguine expectations: with great natural acuteneſs he poſſeſſed the moſt unremitting induſtry; and during his three years reſidence at *Edinburgh* to receive and communicate information conſtituted his greateſt pleaſure. This admirable young man, whoſe early exertions were thus calculated to raiſe ſuch high expectations, was cut off ere he had reached the twenty-firſt year of his age. By his death the public has been deprived of an individual, by whoſe genius and induſtry the art of medicine might have been much improved: his teachers have loſt a pupil, who might have been the boaſt of every ſeminary of education, where he happened to have been placed; and thoſe, who were the companions of his ſtudies, have been bereaved of a friend, to whoſe extenſive knowledge and deep penetration they could have had recourſe on every difficulty."

" A MARBLE monument is erected to his memory in the church-yard belonging to the chapel of St. *Cuthbert*, at *Edinburgh*, on which is the following inſcription :—

* * *

ERRATUM.

Page 55, l. ult. pro. *acid* lege *acrid*.

CHARLES DARWIN,

was born at LICHFIELD,
September 3, 1758;
and died at EDINBURGH,
May 15, 1778.

Poſſeſſed of uncommon Abilities and Activity he had acquired Knowledge in every Department of Medical and Philoſophical Science, much beyond his Years.

He gained the FIRST MEDAL offered by the ÆSCULAPIAN SOCIETY for a Criterion to diſtinguiſh

MATTER from MUCUS;

and had prepared a THESIS for his Graduation on

The RETROGRADE MOTIONS of the LYMPHATIC VESSELS in ſome Diſeaſes.

He cultivated with Succeſs, the Friendſhip of ingenious Men, and was buried by Favor of Dr. A. DUNCAN in this his Family-Vault.

Fame's boaſtful chiſſel, Fortune's ſilver plume,
Mark but the mouldering urn, or deck the tomb!